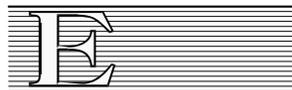




**UNITED NATIONS
ECONOMIC AND SOCIAL COUNCIL**



Distr.: Limited
E/ECA/CFSSD/6/15
August 2009

ORIGINAL: ENGLISH

ECONOMIC COMMISSION FOR 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

**Africa review report on waste management
Main Report**

**INTEGRATED ASSESSMENT OF PRESENT STATUS OF
ENVIRONMENTALLY -SOUND MANAGEMENT OF WASTES IN
AFRICA**

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SEPTEMBER 2009

ACKNOWLEDGEMENTS

This study is a result of country studies conducted by various experts as follows:

Kenya-Ms Jane Nyakang'o, (Director, Kenya National Cleaner Production Centre); Egypt-Prof Saad Hassan, (Ain Shams University, Egypt); Zambia-Mr David Kapindula (Environmental Council of Zambia); Ghana-Dr Idan Afari Idan, (UNIDO consultant on Biofuels), under the overall leadership of Dr Patrick Mwesigye (Director Uganda National Cleaner Production Centre) with Dr John Mbogoma as the International consultant. During the Ad-hoc expert group meeting to review thematic reports for the Commission on Sustainable Development and Sustainable Development Report on Africa held in Addis Ababa, 24-26 June 2009, valuable contributions came from the experts in the plenary and the waste working group. Finally to Dr Rene Van Berkel (Chief, Cleaner and Sustainable Production Unit-UNIDO) for his valuable comments and guidance

This Study was funded by UNIDO and received logistical support from the Secretariat of the Africa Roundtable on Sustainable Consumption and Production (ARSCP).

This report has not been formally edited.

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ABBREVIATIONS

BAT	Best Available Techniques
BEP	Best Environmental Practices
CBO	Community Based Organizations
CCN	City Council of Nairobi
CSD	Commission for Sustainable Development
DCC	Dar es Salaam City Council
ECA	Economic Commission for Africa
ECZ	Environmental Council of Zambia
EPA	Environmental Protection Agency
ESM	Environmentally Sound Management
GDP	Gross Domestic Product
IAEA	International Atomic Energy Agency
JICA	Japan International Cooperation Agency
LCC	Lusaka City Council
MEA	Multilateral Environmental Agreements
MSW	Municipal Solid Waste
NEMA	National Environmental Management Authority
NGO	Non Governmental Organization
OECD	Organization for Economic Cooperation and Development
POP	Persistent Organic Pollutants
PPP	Private Public Partnerships
WTE	Waste to Energy
UN	United Nations
UNIDO	United Nations Industrial Development Organization
UNZA	University of Zambia
WMU	Waste Management Unit

SUMMARY FOR POLICY MAKERS

I. Major Trends and Emerging Issues

Poor waste management practices in particular the widespread dumping of wastes in water bodies and uncontrolled dump sites, aggravates the problems of generally low sanitation levels across the African continent.

Urbanisation is on the rise in Africa and this trend is expected to continue in the future. Of concern is that the infrastructure and land use planning including for waste management is not coping with the growth of urban areas (around 3.5% annually, highest in the world). This is particularly urgent in the slum areas which constitute a big part of many of the cities and towns in Africa.

Waste management infrastructure is largely non-existent in rural areas of Africa. Improvements in infrastructure are urgently needed to combat the high costs of health services, and hence alleviate poverty, and reduce rural-urban migration.

The gap between waste management policy and legislation and actual waste management practices is widening, due to ongoing capacity constraints or non-existence of waste management facilities for the different waste streams. Resolving this capacity gap will require major investments and access to technical know how. The means for accessing these are far-fetched.

Waste generation is expected to increase significantly as a result of industrialization, urbanisation and modernization of agriculture in Africa. This will further aggravate the currently-existing capacity constraints in waste management.

The fast growing use of ICT and rapid turn-over in technology (particularly computers, mobile phones etc.) creates a growing E-waste stream for which there is not yet any waste management capacity, leading to co-disposal of E-waste with municipal waste in dump sites.

The changing lifestyles and consumption patterns of in particular the growing urban middle class is increasing the complexity and composition of waste streams in Africa.

II. Implementation progress and achievements made/best practice

Progress has been made in waste management policies and strategies. The use of economic instruments and implementation of polluter pays principles in waste management has not yet matured in most African countries.

Biogas and compost production from organic waste fractions has been widely accepted in Africa as a best practice, and progress is being made in developing and implementing specific projects in various countries.

Energy production from agricultural residues (including co-generation) is increasingly accepted as a best practice, and several projects have been implemented, some of these with co-funding on basis of carbon credits (with Clean Development Mechanism).

Some countries have refurbishment centers for used ICT equipment which serve to extend the useful life of the products.

Resource Efficient and Cleaner Production has proven to be a feasible best practice for reducing wastes from businesses and other organizations in different parts of Africa and is now being promoted inter alia through the network of UNIDO-UNEP affiliated National Cleaner Production Centres (NCPCs).

III. Current and future implementation challenges and constraints

The single largest implementation challenge remains to create sufficient capacity for environmentally sound management, including where appropriate recovery and recycling, of various waste streams across Africa. Progress towards its realization is constrained by access to finance and technical know how.

Current by-laws put in most places in Africa responsibility for waste management to municipalities which are insufficiently equipped to deal with collection and disposal, and such by-laws are now an impediment to investment in waste management by the private sector.

Imports of second hand consumer goods and production and/or import of substandard products are all contributing to rapid increase in waste generation. Policies should be put in place and existing standards be enforced to reverse this trend.

Implementation and enforcement of waste regulations and conventions is severely constrained by the lack of good governance and transparency and prevalence of corruption in some cases.

Inadequate or limited awareness and appreciation of best practices for environmentally sound management of wastes is a major constraint and a paradigm shift among the communities and society at large is needed.

IV. Lessons learned and recommended priority policy measures and actions to accelerate implementation

Lesson 1: Involvement of the Private sector

The involvement of the private sector in partnership with local communities in solid waste management activities has created employment and job opportunities to a substantial number of jobless city residents, many of whom were previously-unemployed women and youths. Gradually this experience is being built up, and can be passed on between countries.

Lesson 2: Income generation

Solid waste management activities have been serving as means of income generation to people taking part in these activities. Income generated is not only from wage payments but also from sales of items recovered from solid waste. Re-use is possible from waste products like plastic bags, plastic containers, knives, spoons, frying pans, gutters, etc. These cases show that if harnessed well, a monthly income of between US\$ 130-800 can easily be realised. This has to be recognised, appreciated, formalised (including use of terms like salvagers instead of scavengers) and replicated.

Lesson 3: Refuse collection charges

In some cities a sound refuse collection system is in place and forms a good source of income to City and Municipal councils. It is necessary to exchange knowledge and experience in Africa on the successful experiences which can be replicated.

Lesson 4: Practical and attitudinal changes

Manners in which solid waste was previously managed have changed. For example, there are increasing signs of waste being segregated at source and to a large extent being collected and stored in waste bins. Sorting is being done at communal waste collection points with noticeably organized groups of people. Increasingly peoples' attitudes on solid waste are gradually changing so that they no longer regard solid waste as a menace

but rather as a commercial good that can be used to generate income and alleviate poverty attitude among service

Lesson 5: Nuclear energy and associated radio-active waste management

Support from the International Atomic Energy Agency (IAEA) has had tremendous impact on the capacities of some African countries to manage radio-active wastes in safe and environmentally sound ways. With such a highly specialised field and extensive discovery of Uranium deposits in several African countries, technical assistance has to be extended to cover all potential sources of radio-active materials and be sustained over a long period of time.

Lesson 6: E-waste

This being a new challenge on Africa, lessons from the developed countries on the extended producer responsibility could be emulated

V. Conclusions including what Africa expects from the international community

The international community is to support transfer and dissemination of knowledge and technology and foster investments in best practices for environmentally sound management of various waste streams within the African continent. The scale of necessary investments for proper sanitation and environmentally sound management of wastes is beyond the capacity of African countries.

The international community should implement the relevant international agreements/conventions on waste management (particularly Bamako, Basel and Cotonou Conventions) and provide assistance to African countries to strengthening their national human and institutional capacities for implementation and enforcement (especially for control of imports and exports of wastes and waste containing products into and within the region).

The international community should conclude as a matter of urgency the negotiations and ratification of a protocol on liability and compensation for damages under the Basel Convention.

Specific assistance is needed to establish proper inventories of hazardous and radio-active wastes and sites potentially affected by poor management of such wastes, as a basis for developing and implementing facilities for their management and clean up of contaminated sites.

Assistance is also required for awareness and cultural change programs for integrated waste management.

EXECUTIVE SUMMARY

1. Introduction

The typology of wastes generated in Africa from point and non-point sources encompass industrial, agricultural, sewage, domestic, municipal and other wastes including wastes from the medical, nuclear, electrical and electronic industry. These wastes are either non-hazardous or hazardous. Specific data relating to waste generation and characterisation in African countries is generally lacking. Household waste in Africa contains food waste (biodegradable/compostable), sand, gravel, paper, plastic, metals (e.g. aluminium) and glass (the last four components are recoverable, reusable and recyclable). Plastic is a major nuisance in municipal solid waste which degrades the environment, clogs drains and causes flooding in the rainy season.

Waste management problems in Africa are varied and complex with infrastructure, political, technical, social/economic, organisational/management, regulatory and legal issues and challenges to be addressed. Waste is typically disposed off without consideration for environmental and human health impacts, leading to its accumulation in cities, towns and uncontrolled dumpsites. Co-disposal of non-hazardous and hazardous waste without segregation is common practice. Municipal Solid Waste (MSW) management has continually been an intractable problem in recent times beyond the capacity of most municipal/state governments. This has resulted in refuse heaps being dumped in the urban landscape in heavily populated cities as typically only about 40 to 50% of waste is reportedly being collected.

Waste management in the region suffers from limited technological and economic resources as well as poor funding which collectively result in the prevalent low standards of waste management. This is exacerbated by public perception of waste disposal as a welfare service issue and hence the reluctance to pay for waste disposal especially among the poor. The waste management problems are worse in African countries afflicted by conflict and political instability, for instance, Côte d'Ivoire, Sudan, Somalia and Liberia. Such situations provide conducive environments for illegal transboundary traffic of hazardous wastes. Examples are Côte d'Ivoire's experience in August 2006 involving the illegal dumping of dangerous wastes from Estonia and Netherlands. The toxic waste invasion in several African countries (e.g. Nigeria, Benin, Togo, Sierra Leone, Guinea, Zimbabwe), in the 1980s by unscrupulous waste merchants from developed countries led to the adoption of the Bamako Convention on the Control of Transboundary Movement of Hazardous Waste in Africa in 1991.

Across Africa, the legal and institutional/administrative framework for the environmentally sound management of waste is either lacking or inadequate. Not all the countries have ratified the Multilateral Environmental Agreements (MEAs) on wastes and chemicals (in particular the Basel, Stockholm, and Rotterdam Conventions). Comprehensive national waste legislation is lacking although several countries have piece meal legislation on hazardous waste management.

Improper waste disposal in Africa has resulted in poor hygiene, lack of access to clean water and sanitation by the urban poor. Consequently most of the countries in the region may not be able to meet the Millennium Development Goal target of reducing by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015.

The region urgently needs infrastructural, institutional, legal reforms and changes in attitude. It also needs to adopt Environmentally Sound Management (ESM) of wastes including Waste Minimization, focusing on the promotion of the "3Rs" – Reduce, Reuse and Recycle; Waste to Wealth Initiatives towards poverty reduction and alleviation; Corporate Social Responsibility by producers of wastes; and involvement of multiple stakeholders, for example, under the NEPAD Initiative, while also exploring alternative options in waste management such as Public-Private Partnerships and Waste Exchange.

2. Recommendations

Based on the knowledge available on the continent and the baseline information collected from the four countries namely, Ghana, Egypt, Kenya and Zambia, the following can be recommended in regard to the main international commitments for environmentally sound management of waste, as reflected in Agenda 21 and the Johannesburg Plan of Implementation.

2.1 *Prevent and minimize waste and maximize reuse, recycling and use of environmentally sound alternative materials, with the participation of government authorities and all stakeholders. Among others: encouraging production of reusable consumer goods and biodegradable products and developing the infrastructure required.*

(a) Policy and Planning

- It is important that policies and comprehensive waste and hazardous waste management strategies, (integrated waste management) including basic elements like waste collection, waste treatment, waste recycling, disposal sites, etc. should be in place. These would address recycling of items such as papers, plastics, batteries, lubricating oils and electronic wastes.
- Integrated waste management plans have to support pro-poor involvement in waste management as a source of employment and hence income generation.

(b) Legal aspects including enforcement

- There is a need of strict enforcement of the law and progressively provide for continuous reviews and updates of legislation so as to tailor it to suit, as well as enable it to attain the vital coping mechanisms to deal with new developments and future challenges such as electronic wastes and adopt the principle of extended producer responsibility as it is increasingly practiced in several industrialised countries.

(c) Key stakeholders, their roles and coordination and partnerships

- It is important to enhance the integration and coordination among different concerned parties and the responsibilities of the various agencies involved should be clearly defined to eliminate confusion and effort duplication. The partners should be drawn from Central Government, local authorities, NGOs, the community and industry.
- The current waste management experience demonstrates that formal organizations alone cannot deal adequately with the increasing volumes and complexity and diversity of urban wastes. To address the waste management challenges of the cities through sustained waste recycling, re-use and composting programs, a partnership approach needs an appropriate framework, which clearly lays out responsibilities of each party for effective waste management. This is calling for the development of Integrated Waste Management Systems in urban centres.
- Private-Public Partnerships (PPPs) should be encouraged so that the private sector can set up recycling centres, landfills and incinerators designed in such a way to bring in participation of women and the youth.

(d) Cleaner Production

- The promotion of cleaner production practices, methods, policies and technologies should be done in order to ensure efficient use of raw materials and energy resources whilst minimizing waste

generation. There is need at country level to enhance capacity building and create awareness on the importance and benefits of cleaner production

(e) Technologies

- A multi-sectoral plan should be developed to spearhead the development and dissemination of appropriate technologies and practices for environmentally sound management of wastes. This should ensure that all sectors are able to handle their specific wastes without jeopardizing human health and the environment. The Egyptian technology and experience for the conversion lingo-cellulose residues to ethanol for example, should be considered by other countries with large amounts of agro-wastes.
- Application of various waste recovery techniques and technologies such as briquetting, incineration, pyrolysis, gasification and biodigestion should be adopted as economical, efficient, cost effective and environmentally friendly ways of disposing organic wastes.

2.2 *Develop waste management systems and extend waste service coverage. Among others develop and promote integrated management solutions to minimize urban and industrial waste generation and to promote recycling and reuse*

(a) Capacity building and Training

- It is important to promote the on-going training of various stakeholders on environmentally sound management of wastes using the existing institutions. This should also include integrating sound management of wastes into curricula at different schooling levels. Special needs for customs officers and enforcement agencies should be addressed.
- Environmental Agencies and Local Authorities should be strengthened to enhance participation of stakeholders in the implementation of the waste management plans which will address source reduction, reuse and recycling of hazardous waste.

(b) Public awareness

- It is important to mount a strong public awareness campaign on the impact of different types of wastes on human health so as to increase community participation and positive attitude and knowledge on the quantity, type and toxicity of hazardous waste and their environmentally sound management.
- There is a need for continued training and sensitization among media personnel to equip them with knowledge on emerging issues in waste management including electronic waste.

(c) Staff and equipment

- It is important to increase the number of qualified and trained personnel to manage and operate various waste management systems and equipments.

(d) Finance and cost recovery

- It is important to encourage the private sector to take part in investing in waste management systems and issues of high cost of capital should be addressed.
- There should be more funding to NGOs and the media to enable them to play their advocacy roles for environmentally sound management of waste.

(e) Monitoring

- It is important to create special bodies for monitoring, reporting and following up the quality and quantity of waste and their fate.
- There should be regular audits of the quality of emissions of incinerators and other medical waste treatment units.

(f) Waste characteristics

- Generation rates and waste data and characterisation on types, sources and composition of waste has to be improved further because planning for sustainable waste management requires good and reliable national data on generation levels and composition.

(g) Waste Management practices

- It is recommended that segregation of waste components from the point of generation should be done with the establishment of transfer stations with suitable capacity and stockpiles of all crushed materials should be stored in separate and secured designated storage areas to avoid contamination or deterioration by weathering.

(h) Collection system

- Efforts should be directed towards increasing the collection efficiency of all types of wastes and their collection and transportation services, but there should be strict control of the handling of special or hazardous wastes (e.g. chemicals, medical wastes) and prohibit its recycling or reuse.

(i) Transportation

- It is important to develop a transportation system to transport various waste streams from rural and urban areas to suitable disposal and treatment facilities.
- There is need to increase the number and appropriateness of vehicles for collection and transportation of waste. Further, local authorities should consider the use of Geographic Information Systems (GIS) and Remote Sensing (RS) to improve waste mapping and assist effective collection and transport.

(j) Recycling

- It is important to introduce appropriate incentives to promote the usage of recycled, recyclable and/or biodegradable items for daily use, including for example recycled paper bags and biodegradable plastic bags.
- Wastes containing metals such as steel, copper and aluminum should be sold to factories in order to be recycled in producing new metals and all construction and demolition wastes such as bricks, concrete, stone and marble should be crushed on site to a uniform quality of adequate grading in order to maximize their reuse as recycled aggregates and filling materials.
- It is important for NGOs and local authorities, to support the creation of regional networks which promote waste recycling and reuse.
- Waste management operations would benefit greatly from the development and implementation of national policies on solid waste management that criminalize inappropriate waste management, including for example incineration or land filling of recyclables and compostables.

(j) Recovery

- Promotion of the production of compost should be enhanced and suitable enabling systems and techniques developed and disseminated for affordable collection and transport of organic waste from farms and other sources.
- Where feasible, the scope of agriculture waste reuse or recycling by using it as source of energy, briquetting, composting, biogas production, ethanol production and animal fodder should be explored.

(k) Incineration.

- It is important to ensure all hospitals and other medical facilities can dispose of their medical wastes in properly equipped incinerator or autoclave/shredding system which can handle such waste in an environmentally sound manner.

(l) Land filling/dumpsites

- Disposing of wastes should be carried out in controlled landfills to prevent any contamination to water and soil.
- Selection, design, construction and operation of landfill sites should take place within proper environmental management systems in order to protect the environment during the whole lifespan of the landfill.
- There has to be continual rehabilitation of the controlled dump sites and methane capture should be put in place.
- There should be strict control of the handling of medical and other hazardous waste and prohibit its recycling or reuse.

2.3 Ratification and implementation of relevant international instruments on hazardous waste including the Bamako Convention, the fourth Lome Convention and the Basel Convention and its protocol on liability and compensation for damage resulting from the trans-boundary movement and disposal of hazardous waste.

(a) Ratification

- It is important for the rest of African countries that have not yet ratified the relevant international instruments for hazardous waste (including Basel and Bamako Convention) to do so as to speed up the development and implementation of nation action plans for implementation.

(b) Financial instruments

- Appropriate financial instruments and other means of implementation complementary to the Regional Centres under the Basel convention have to be put in place to accelerate the implementation of the Basel convention.

(c) Bamako Convention challenges

- Challenges around the ratification and eventual implementation of the Bamako Convention have to be addressed at various Africa Union fora.

(d) Protocol on Liability and Compensation of the Basel Convention

- Challenges around the non-ratification of the Protocol on liability and compensation for damages have to be addressed among the parties.

(e) Inventories of Hazardous wastes

- It is important that African countries prepare inventories of hazardous wastes and sites potentially affected through inappropriate disposal of hazardous wastes to enable targeted national and international remedial actions.

2.4 Preventing international illegal trafficking of hazardous wastes and to prevent damage resulting from the trans-boundary movement and disposal of hazardous wastes in a manner consistent with obligations under relevant international instruments.

(a) Regional Cooperation

- In order to manage trans-boundary movement of hazardous waste effectively including illegal trafficking there is a need to strengthen trans-border controls and policing of waste transports through strengthening cooperation with neighbouring countries. Revenue authorities should also be involved in implementation of these agreements.

(b) Hazardous wastes of concern

- Used consumer goods that contain hazardous materials (e.g. electronic and electric products, cars, medical equipment, pharmaceuticals etc.) are becoming an issue and pose serious ecological and health threats. There is hence a need for concerted efforts at a regional and international level to prevent and minimize these concerns.

2.5 Global and regional cooperation, including exchange of information and experience and transfer of appropriate technologies to improve the management of radio-active wastes:

(a) Exchange of information

- There is an urgent need to improve the exchange of information on radio-active wastes, including volumes, best practices and storage methods. The IAEA needs to cooperate more actively with African countries on minimization and management of radio-active waste.

(b) Energy mix option

- The management of radio-active wastes of such facilities should be planned as an integral part of developing the energy mix.

(c) Management in an environmentally sound manner

- The management of radio-nuclides mined either intentionally (uranium) or as by-product (e.g. gold, cobalt etc.) has to observe environmental safeguards. This equally applies to imported products that contain radio-active materials (e.g. medical applications) and the management of the waste thereof.

2.6 Support the clean up of sites contaminated as a result of all types of nuclear activity and to conduct health studies in the regions around those sites as appropriate with a view to identifying where health treatment may be needed and should be provided:

- It is important to comprehensively identify sites that potentially have been contaminated with radio-active wastes in Africa.

2.7 *Sound management of radio-active waste including:*

- *Sound storage, transportation, trans-boundary movement and disposal of radio-active wastes guided by all the principles of the Rio Declaration on Environment and Development and Agenda 21*
- *Provision of technical assistance to African countries to enable them to develop or improve procedures for management and safe disposal of radio-active wastes*
- *Intensify safety measures with regard to radio-active wastes*

While African countries acknowledge the importance of sound management of radio-active wastes, the capacity to do so remains still very low across Africa, as only few countries (e.g. Egypt) have given priority to develop and implement comprehensive radio-active waste management systems.

1 BACKGROUND TO THE STUDY

The United Nations Industrial Development Organization (UNIDO) initiated a study on the status of environmentally sound management of wastes and chemicals in Africa. This was expected to result in regional review reports which would be prepared for, and in collaboration with, the UN Economic Commission for Africa (ECA), to support its preparations for the 2010 session of the Commission for Sustainable Development (CSD) which will amongst others specifically consider progress made towards environmentally sound management of waste and chemicals.

The UNIDO project was designed to produce two technical review studies, respectively on environmentally sound management of waste and on environmentally sound management of chemicals. Each study would appraise the current status of relevant management policies, practices and systems, identify key priorities for improvement and provide practical recommendations for policy and other interventions. Each study would comprise a regional section describing initiatives and achievements that cover multiple countries in Africa, supported by national reviews for selected countries from different African regions. The draft studies were subjected to technical peer review by means of an Expert Group Meeting, co-organised by the Economic Commission for Africa, United Nations Industrial Development Organisation and United Nations Environment Programme.

Four countries (namely Egypt, Ghana, Kenya and Zambia) were selected from different African regions to undertake a review of the status of environmentally sound management of waste and present findings, conclusions and recommendations in a draft national study, following the scope and methodology set by the international team leader. This entailed compiling, analysing and synthesising information on policies for environmentally sound management of wastes. The study was undertaken under the direction of the UNIDO project manager and the international team leader and expert on waste.

The national reviews would contribute towards an integrated set of conclusions and recommendations for environmentally sound management of waste in Africa. This report presents and discusses the review findings at the regional level.

2 INTERNATIONAL AGREEMENTS AND COMMITMENTS TO ENVIRONMENTALLY SOUND MANAGEMENT OF WASTE

The three chemicals and waste conventions namely, Basel, Rotterdam and Stockholm Conventions are designed to protect human health and the environment from effects of hazardous chemicals and wastes. Although legally separate, each governed by its respective Conference of Parties, they all address the same fundamental challenge namely, the environmentally sound management of hazardous products during their entire lifecycle from production to disposal, and where possible their minimization and/or replacement with safer alternatives

Waste Management

The Basel Convention (Article 4) requires each Party to minimize waste generation and to ensure, to the extent possible, the availability of disposal facilities within its own territory. The objective of environmentally sound management of hazardous wastes underpins the Convention. At its fifth meeting in December 1999, the Conference of the Parties adopted the Basel Declaration on Environmentally Sound Management.

The Stockholm Convention (Article 6) obliges Parties to develop strategies for identifying Persistent Organic Pollutants (POPs wastes), and to manage these in an environmentally sound manner. The POPs content of wastes is generally to be destroyed or irreversibly transformed. The Basel Convention Technical Working Group is developing technical guidelines on POPs wastes as part of its work programme and at the request of the Conference of Parties that adopted the Stockholm Convention.

Import/export controls

The original Prior Informed Consent procedure of the Basel Convention (Article 4.1) was strengthened by Parties' subsequent decisions to prohibit the export of hazardous wastes from OECD to non- OECD countries (Decisions II/12 and III/1). The Basel Convention imposes strict conditions on the transboundary movement of hazardous wastes (Articles 4 and 6). Trade with non-parties is generally not permitted (Article 4.5). The Rotterdam Convention (Articles 10 to 12) established a Prior Informed Consent Procedure based on the earlier voluntary guidelines. The Stockholm Convention (Article 3.2) restricts the import and export of POPs to cases where, for example, the purpose is not for environmentally sound disposal. It also requires that POPs not be transported across international boundaries without taking into account relevant international rules, standards and guidelines (Article 6.1).

Environmental Releases

The Stockholm Convention requires Parties to take measures to reduce or eliminate releases of POPs from intentional production and use (Article 3), unintentional production (Article 5) and stockpiles and wastes (Article 6). The principles of Best Available Techniques (BAT) and Best Environmental Practices (BEP) are to be further elaborated for and on behalf of the Conference of the Parties.

Hazard Communication

Provision is made for the obligatory communication of hazard information under the Basel Convention (Article 4.2 f), the Rotterdam Convention (Article 5.1) and the Stockholm convention (Article 10).

Technical Assistance

All three Conventions address the technical assistance needs of developing countries. The Basel Convention (Article 14) and the Stockholm Convention (Article 12) provide for regional centres for training and technology transfer, subject to views of Conferences of Parties. Basel has a Technical Cooperation Trust Fund, while Stockholm Convention (Articles 13 & 14) has a "financial mechanism", operated by the Global Environment Facility (GEF) for the development of National Implementation Plans (NIP).

3 STATUS, EFFECTIVENESS, EFFICIENCY AND SUSTAINABILITY OF INTERNATIONAL POLICY AND BEST PRACTICE INITIATIVES IN REGARD TO ENVIRONMENTALLY SOUND MANAGEMENT OF WASTES IN AFRICA

The typology of wastes generated in Africa from point and non-point sources encompass industrial, agricultural, sewage, domestic, municipal and other wastes including wastes from the medical, nuclear, electrical and electronic industry. These wastes are either non-hazardous or hazardous. Specific data relating to waste generation and characterisation in African countries is generally lacking (see Tables 3.1 and 3.2). Household waste in Africa contains food waste (biodegradable/compostable), sand, gravel, paper, plastic, metals (e.g. aluminium) and glass (the latter four components are recoverable, reusable and recyclable). Plastic is a major nuisance in municipal solid waste which degrades the environment, clogs drains and causes flooding in the rainy season.

Table 3.1: Solid Waste Generation and collection rates in African Cities

City	Per capita annual waste generation (kg/year)	Households with garbage Collection (%)
Abidjan./Cote D' Ivoire	365	70
Ibadan/Nigeria	401	40
Kinshasa/Congo	438	Not Available
Bujumbura/Burundi	511	41
Lome/Togo	693	37

Source: Municipal Solid Waste Management in Asia and Africa, a comparative analysis by Mohamed Eisa and C. Visvanathan, UNIDO, 2002, page 10

Table 3.2 Waste compositions in African Cities

Composition (% by weight)	Kumasi Ghana	Accra Ghana	Ibadan Nigeria	Kampala Uganda	Kigali Rwanda
Organic	84	85.1	55.8	75	94
Plastic	-	3.4	6.3	-	-
Glass	-	1.9	1.8	-	-
Metal	-	2.6	-	-	-
Paper	-	4.9	12.9	-	-
Inert	-	-	-	-	-

Source: Municipal Solid Waste Management in Asia and Africa, a comparative analysis by Mohamed Eisa and C. Visvanathan, UNIDO, 2002, page 10

Waste management problems in Africa are varied and complex with infrastructure, political, technical, social/economic and organizational/management. Moreover, regulatory and legal issues and challenges need to be addressed. Waste disposal is generally practiced than waste management. Co-disposal of non-hazardous and hazardous waste without segregation is common practice. Municipal Solid Waste (MSW) management has continually been an intractable problem in recent times beyond the capacity of most municipal/state governments. This has resulted in refuse heaps being dumped in the urban landscape in heavily populated cities as only about 40 to 50% of waste is routinely collected.

Box 3. 1: Case study-improvement in Solid Waste Management in Dar es Salaam (1992-1999) and five other Municipalities in Tanzania (1999-2004) ¹

Before 1992, the Dar es Salaam city council (DCC) had failed to provide an effective solid waste collection service for the city. While solid waste generated at that time amounted to 1400 tonnes of waste a day the DCC was only capable of collecting between 30 and 60 tonnes (2%-4%) of this amount. The city environment was characterized by large amounts of dumped garbage in public open spaces, on streets and major roads and in open drains, resulting in flooded roads, ground water pollution, soil contamination, and escalating outbreaks of communicable diseases like cholera, diarrhoea and dysentery. The situation was particularly serious in the central business district. The main reasons for the DCC's failure to manage solid waste was due to lack of equipment; lack of financial resources to purchase spare parts and fuel for the fleet, mixed signals on political will; un-focused City leadership and lack of an official disposal site.

Under the auspices of the Sustainable Cities Programme (a UN Habitat programme) a working group on solid waste management was thus formed, with the Dar es Salaam City Council as a lead partner. The Overall objectives adopted by the working group on solid waste management was to improve the cleanliness of the city through increase of collection and disposal of waste, to create sustainable income generating activities for community based organisations and small trade enterprises involved in waste collection and recycling and reduce the amount of waste by encouraging recycling reuse and composting

In order to achieve these objectives, the following strategies were formulated:

- Conducting emergency city-clean-up campaigns
- Involvement of the political, administrative and city/municipality decision making machinery from the grassroots
- Private sector involvement in solid waste management
- Community involvement in solid waste management through awareness activities and pilot demonstration projects
- Improved management of refuse disposal sites and
- Promotion of recycling reuse and composting

The strategies are being implemented on the ground through sustainable projects involving:

- Provision of communal waste storage facilities
- Procurement of solid waste collection equipment
- Development of a sanitary landfill and landfill gas extraction
- Creation of public awareness campaigns and,
- Promotion of community based solid waste collection.

With the exception of a sanitary landfill development project, implementation of other projects was successful to the extent of achieving over 55% of the expected output. Successes achieved in implementing demonstration projects were scaled up to work for the whole city and were later replicated to other five Municipalities in the country from 1999 to 2004.

Key lessons have been learnt throughout this period as follows:

Lesson 1: Involvement of the Private sector

The involvement of the private sector under arrangements and local communities in solid waste management activities have created employment and job opportunities to a substantial number of jobless city residents, many of whom were previously unemployed women and youths.

Lesson 2: Income generation

Solid waste management activities have been serving as means of income generation to people taking part in the activities. Income generated is not only from wage payments but also from sales of items recovered from solid waste. Re-used solid waste produce items like plastic bags, plastic containers, knives, spoons, frying pans, gutters, etc. Which are existing on sales in major markets in the city. In addition, charges that service users pay "Refuse collection charges" is another good source of income to the Dar es Salaam City Council and the five Tanzania Municipalities

Lesson 3: Practical and attitudinal changes

Manners in which solid waste was previously managed have changed. For example, there are increasing signs of waste being segregated at source and to a large extent being stored in dust bins, sorting being done at communal waste collection points and that, there being noticeable organized groups of people already involved in solid waste recycling. Increasingly peoples' attitudes on solid waste are gradually changing so that, they no longer regard solid waste as a menace but rather as a commercial good that can be used to generate income and alleviate poverty.

Waste management in the region suffers from limited technological and economic resources as well as poor funding which collectively result in the prevalent low standards of waste management. This is exacerbated by

¹ Source: Dar es Salaam City Council, Tanzania

public perception of waste disposal as a welfare service issue and hence the reluctance to pay for waste disposal especially among the poor. The waste management problems are worse in African countries afflicted by conflict and political instability, for instance, Côte d'Ivoire, Sudan, Somalia and Liberia. Such situations provide conducive environments for illegal transboundary movement of hazardous wastes. Examples are Côte d'Ivoire's experience in August 2006 involving the illegal dumping of dangerous wastes from Estonia and Netherlands. The toxic waste invasion of several African countries (e.g. Nigeria, Benin, Togo, Sierra Leone, Guinea, Zimbabwe), in the 1980s by unscrupulous waste merchants from the developed countries led to the adoption of the Bamako Convention on the Control of Transboundary Movement of Hazardous Waste in Africa in 1991.

Across Africa, the legal and institutional/administrative framework for the environmentally sound management of waste is either lacking or inadequate. Not all the countries have ratified the Multilateral Environmental Agreements (MEAs) on wastes and chemicals (e.g. the Basel, Stockholm, and Rotterdam Conventions). Comprehensive national waste legislation is lacking.

Improper waste disposal in Africa has resulted in poor hygiene, lack of access to clean water and sanitation by the urban poor. Consequently most of the countries in the region may not be able to meet the Millennium Development Goal target of reducing by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015.

The region urgently needs infrastructural, institutional, legal reforms and changes in attitude. It also needs to adopt Environmentally Sound Management (ESM) of wastes including Waste Minimization, focusing on the promotion of the “3Rs” – Reduce, Reuse and Recycle; Waste to Wealth Initiatives towards poverty reduction and alleviation; Corporate Social Responsibility by producers of wastes; and involvement of multiple stakeholders, including Public-Private Partnerships.

Box 3.2: Estimated monthly Income earned by scavengers in some parts of Africa

- ❖ South Africa US\$ 100-800
- ❖ Senegal US\$ 600-800
- ❖ Kenya US\$ 130

Source: Source: Solid waste experts' workshop held in Dar es Salaam, Ardhi University, United Republic of Tanzania from 20th -22ND June 2007 (organized by the Basel Convention Regional Centre, The World Bank Institute and the Golder Associates (South Africa))

Box 3.3 Challenges of Waste Collection System at Wagodogo Municipality, Ouagadougou, Burkina Faso (West Africa)

Wogodogo is within the capital city of Ouagadougou with approximately 25,000 inhabitants and between 1600 to 2000 households. Before 1993 there was no organized collection system of solid waste and disposal by private sector operators involved merely open dumping at the outskirts of the city.

A Project by the “Center Regional pour L'Ease et L'Assainissement” (CREPA) sought solutions for environmental problems in neighbouring cities and several other countries. In the first year, the project launched curbside collection by group of women and men. The following year, composting activities on commercial basis were initiated.

Later the project modified the transport animal carts to increase the carrying capacity and discharge of waste and built a transfer point for storage, garbage treatment and recycling purpose. The local municipality discharges the waste at transfer point using municipality truck and labourers. At this end of the service chain, the municipality and project management has been confronted by a lot of difficulties regarding collaboration between the two. The municipality was not able to implement the Project recommendations due to several disagreements and lack of financial resources. This has proved so far as the principal weak point of the project.

Source: Municipal Solid Waste Management in Asia and Africa, a comparative analysis by Mohamed Eisa and C. Visvanathan, UNIDO, 2002, page 21

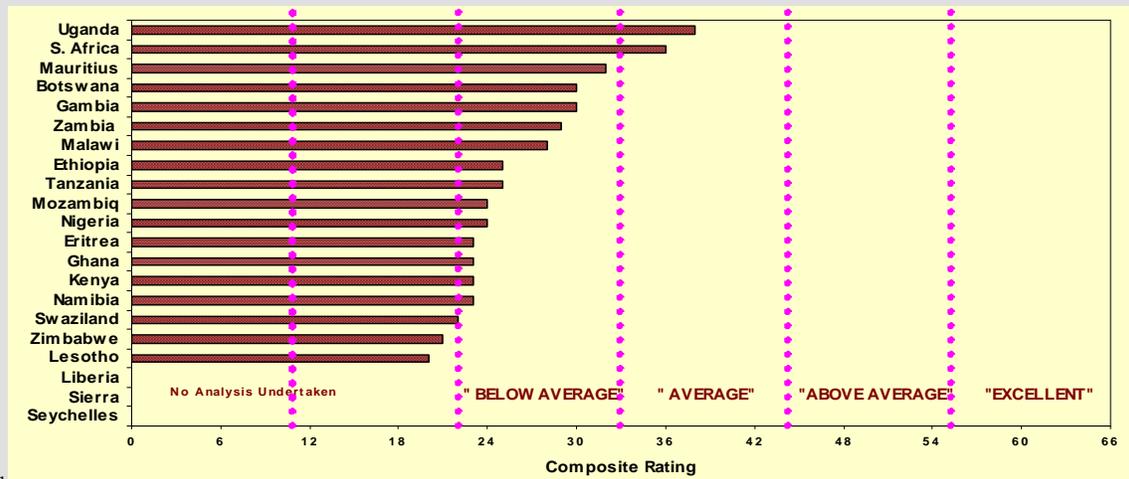
Box 3.4: Assessment of waste management capacities in some countries in Africa

A Regional Needs assessment was conducted in the period June/July 2001 covering the whole region of the English speaking African countries on the basis of which capacity building activities were initiated. A rating scheme was used based on the following points.

- Priority given to waste management
- Skills in waste management
- Financial resources
- Facilities and infrastructure
- Monitoring and information
- Training activity
- Project activity
- Institutional network
- Regulatory framework
- Legislative enforcement
- Administrative system

The figure below show the status of management of waste in the Region as at 2001

Rating of Waste Management Capacity in some parts of Africa



For the English speaking African countries to address the key issues which were identified in 2001 and updated in 2004, more remains to be done as confirmed through responses from countries in July 2004 and 2006

Source: Pretoria based Basel Convention Regional Centre (2000-2006)

4 SUMMARY OF THE SITUATION ANALYSES

4.1 EGYPT

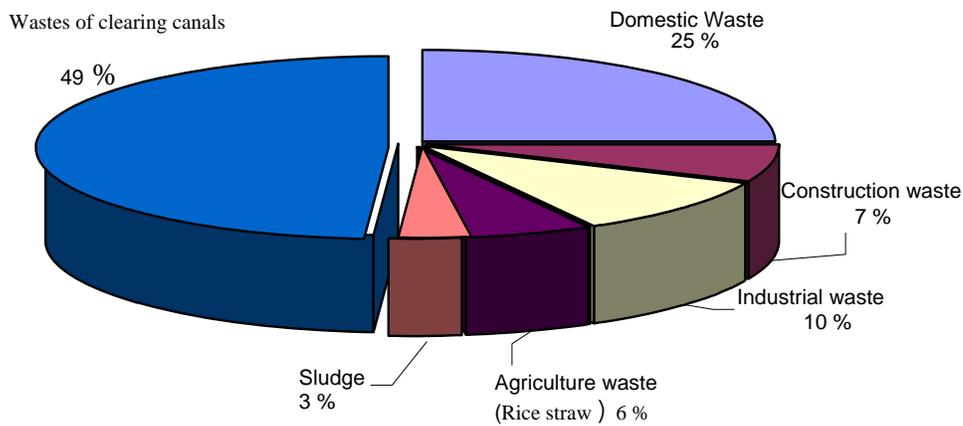
Overview of Waste Management

Solid waste is generated by almost all economic activities in Egypt, and has many impacts on the environment, including pollution of air, surface water and groundwater. Poor waste management causes risks to public health and the environment while at the same time increasing demand for natural resources.

With the growing population and development pressures, the problem of solid waste has worsened considerably in both urban and rural areas. Its negative manifestations on public health, environment and national economy are becoming quite apparent and acute. The World Bank (2002) has estimated that the overall cost of environment degradation in Egypt is LE 10-19 billion annually which is representing 3.2-6.4% of GDP. However, the cost of environment damage due to solid waste has been estimated as 0.2% GDP. According to a 2007 survey, the type and quantity of solid wastes generated annually in Egypt is 66-70 million ton/ year. These wastes are categorized in Table 4.1.

Table 4.1: Types and quantities of each of these categories in Egypt

Type and source of waste	Quantity generated (tone /year) , million
Agriculture (rice straw only)	4 -4.5
Industrial	6 - 6.5
Domestic (Municipal or Garbage)	16 – 17
Construction and demolition	4 -5
Sludge from wastewater treatment plants	3 – 3.5
Medical	0.1 – 0.13
Cleaning of water canals and drainages	30 – 32



4.2 GHANA

4.2.1 Institutional and organizational aspects

General Waste Management in Ghana is the responsibility of the Ministry of Local Government and Rural Development, which supervises the decentralized Metropolitan, Municipal and District Assemblies (MMDAs). However, regulatory authority is vested in the Environmental Protection Agency (EPA) under the auspices of the Ministry of Environment and Science. The Metropolitan, Municipal and District Assemblies are responsible for the collection and final disposal of solid waste through their Waste Management Departments (WMDs) and their Environmental Health and Sanitation Departments. The policy framework guiding the management of hazardous, solid and radio-active waste includes the Local Government Act (1994), Act 462, the Environmental Protection Agency Act (1994), Act 490, the Pesticides Control and Management Act (1996), Act 528, the Environmental Assessment Regulations 1999, (LI 1652) the Environmental Sanitation Policy of Ghana (1999), the Guidelines for the Development and Management of Landfills in Ghana, and the Guidelines for Bio-medical Waste (2000). All these Acts and Regulations emanate from the National Environmental Action Plan. And yet these laws are not deterrent enough in ensuring clean, safe and healthy environment.

4.2.2 Waste Management practices

(a) Solid waste

Solid waste is collected and disposed of at designated landfill and waste dump sites by public and private waste management firms. The issue of landfill site location has been a matter of strenuous negotiations with rising population pressure continuing to impact on waste generation and management. Coastal and marine-based industries tend to pollute coastal areas through the discharge of untreated wastes into the marine environment.



(b) Hazardous Wastes:

The sound management of hazardous, solid and radio-active waste has received serious attention from Government, human settlement planners, real estate developers, environmentalists and many non-governmental organizations. Bio-medical and other hazardous waste are currently being managed through land filling. In response to the global mandate for environmentally sound management of hazardous, solid and radio-active waste, Ghana has, among other things, embarked on a life cycle approach to address chemicals and other hazardous wastes management in an integrated manner. This involves a broad range of stakeholder institutions and organizations including non-governmental organizations. With respect to Hazardous Waste Management, there are currently no clearly distinguishable methods for the disposal of hazardous waste. However, the Environmental Protection Agency (EPA) is responsible for the provision of guidelines for such wastes. A Draft Hazardous Waste Control bill is currently before cabinet for consideration. (



(C) Radio-active Wastes

Ghana since the early 1950's has been engaged in activities, which make use of ionizing radiation, radiation sources and radio-active materials in medicine, industry, agriculture, research and teaching. The major challenges that face the country are the management of spent sources, orphan sources, and radio-active wastes generated from practices and radiation sources within practices. The waste management system consists of a decontaminated unit intended for low and intermediate level waste storage and concrete wells for interim storage of spent fuel. The suitability of these facilities has been assessed for waste storage and processing and their contamination units and wells found to be in good condition for refurbishment for use as waste processing and storage facilities. A new storage facility with a capacity of 100 of 100 litre drums has been constructed to complement the existing structure. The new facility is consistent with current trends in waste management technological development and IAEA standards. The Ghana Atomic Energy Commission, recognizing the need to establish the basic requirement for the protection of people against undue radiation exposure from unsafe practices established the Radiation Protection Board (RPB) in 1993 through amendments to the Atomic Energy Act (Act 204) of 1963 and PNDC Law 308. This Law has been further strengthened by regulations and Legislative Instrument, (LI 1559 of 1993). The Radiation Protection Board as the sole regulatory authority was mandated to establish an inventory of radiation sources in the country and evolve protection and safety strategies for the control of the radiation sources and safe disposal of radio-active waste. No person, body or institution shall generate or manage waste without a valid license from the

Radiation Protection Board. RPB has the power to suspend, revoke any license for waste management if the licensee does not satisfy the terms and conditions for the authorization. Radio-active waste is managed by the National Radio-active Waste Management Centre and the National Nuclear Research Institute of the Ghana Atomic Energy Commission. Radiation and waste safety infrastructure have been developed with the assistance of the International Atomic Energy Agency (IAEA) for the safe use and management of radio-active waste arising from all practices.

Ghana has been a member of the International Atomic Energy Agency (IAEA) since 1963. The Parliament of Ghana has approved the ratification of the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radio-active Waste Management.

Since radio-active waste management is an integral part of a safety regime for the utilization of nuclear and nuclear-related applications, the Radio-active Waste Management Regulations were drafted and a National Seminar on “Understanding and Implementation of Regulations on Radio-active Waste Management in Ghana” was held from 9-11 October 1996 to receive feedback and responses from stakeholders. The final draft was presented to government for promulgation in 1997 after review by RPB and Attorney General’s Department. One of the key components of the regulation is the establishment of a National Radio-active Waste Management Centre (NRWMC) in 1995 by the Ghana Atomic Energy Commission even though the regulations had not been enacted. The NRWMC serves as a location for collection, segregation, treatment and storage of waste from generators.

(d) E-waste

The country’s Environmental Protection Agency (EPA) has stated that the importation of obsolete electrical and electronics equipment from the developed world into Ghana and other African countries has worsened these countries’ e-waste control and management situation, as many devices and components proved unsuitable for reuse. The growing e-waste volumes and the absence of a well organised collection and management systems have also impacted negatively on the environment, local communities and the economic systems of Ghana. This situation compounds the local e-waste generation problem leading to the accumulation of large volumes of hazardous waste. E-waste is routinely disposed of on uncontrolled dump sites where waste volumes are periodically reduced by setting them on fire. This has resulted in a whole range of toxic substances released, which heavily contaminate the soil and water resources. E-waste management does not only pollute natural resources and endanger people’s health, but also affected the substantial business opportunities in material recovery and recycling especially in industrialised countries.

EPA has taken the initiative to work with the mobile phone operators on how to manage end-of-life mobile phones and their batteries.

(e) Waste to Energy

The government through the Ministry of Energy (MoE) of the republic of Ghana in collaboration with the Energy Commission have realised the importance of creating an enabling environment for the development of renewable energy resources. With this purpose, a draft of the final report, “Draft Renewable Energy Bill” has been proposed for parliament to be passed into a law. The bill sets out the framework of institutions, regulations, guidelines and programmes for the development of renewable energy. When passed into a law, it will help to bring clarity to the roles and responsibilities for different institutions and provide a framework for setting targets and providing incentives for the renewable energy sector.

Ghana is endowed with significant renewable energy potential which if developed would reduce the dependence on fossil and non-renewable energy resources. Waste-to-energy (WTE) or energy-from-waste (EFW) is the process of creating energy in the form of electricity or heat from the incineration of waste source. WTE is a form of energy recovery. Waste to energy (WTE) is the term used to describe the conversion of waste by-products into useful steam or steam-generated electricity through combustion, or produce a combustible fuel commodity, such as methane, methanol, ethanol or synthetic fuels. Typically, WTE is produced by converting municipal solid waste (MSW), which is defined as residential and commercial

refuse, and makes up the largest source of waste in Accra. Recently, however, the definition of waste has been expanded from MSW to include wastes such as wood, wood waste, peat, wood sludge, agricultural waste, straw, tires, landfill gases, fish oils, paper industry liquors, railroad ties, and utility poles. Million of tons of trash can be potentially processed each year in WTE facilities to generate steam and electricity in Accra. The benefits to society include the following: preventing the release of greenhouse gases such as methane into the atmosphere if the trash were landfilled; reducing the impact on landfills by reducing the volume of the waste 80 to 90 percent; providing an alternative to charcoal use, which prevents the release of emissions such as carbons etc into the atmosphere during processing; and saving the earth's natural resources by using less oil, charcoal, or natural gas for electricity generation.

4.3 KENYA

4.3.1 Institutional and organizational aspects

Legislative tools in place for solid waste management for Kenya include; Local Government Act Cap 265 and the Public Health Act Cap 242 which make it a duty for Local Authorities to maintain their areas of jurisdiction at all times in a clean sanitary condition, the Environmental Management and Coordination Act (EMCA, 1999) that calls for development of standards and regulations to manage waste, and the Physical Planning Act Cap 386 that provides for waste disposal at designated sites only. At the local level are the policies and by-laws of the Councils that include: the General Nuisance by-law, Solid Waste Management By-law, and in Nairobi, the Private Sector Involvement Policy on Solid Waste Recycling and Composting Policy.

Waste management is vested on the local authorities through the Local Government Act Cap 265 and the Public Health Act Cap 242. Resulting from these, local authorities have enacted by-laws to help manage waste. For industries and businesses the Environmental Management and Coordination Act (EMCA), 1999 rests on them the responsibility for management of the wastes they have generated

4.3.2 Waste characteristics

There are no national statistics on waste generation levels in Kenya. However, per capita municipal waste generation in urban areas of Kenya is estimated to range between 0.29 and 0.66kg/day (NEMA, 2005). Healthcare waste generated is approximately 909,182tons/year with infections waste comprising 75%. No national figures could be found for the other categories of waste. For municipal waste, data for four towns was found: Nairobi generates about 2400 tons waste/day whilst Nakuru, Kisumu and Mombasa generate 700 tons, 900 tons and 1500 tons respectively (NEMA, 2005). About 61% of these municipal waste is generated from residential areas, 21% from industrial activities whilst the rest comes from hospitals, markets and other sources (NEMA, 2005). The complexity of waste generated is increasing due to changing production and consumption patterns, increased urbanisation, industrial and service activities.

4.3.3 Collection, transportation, recovery, incineration and landfilling

The current waste management situation 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. Waste collection and transportation is limited by inadequate equipment, personnel and financial resources facing all local authorities. A JICA study done in the City of Nairobi estimated that local authorities spend 30% of their budgets on waste management and cleansing. Of this, 70% goes to transportation of waste. To bridge this gap, private sector involvement in waste management is growing. In Nairobi for example, where waste collection levels stand at 56%, the City Council collects 500 tons/day, 19 private licensed companies collect another 500 tons/day while waste recyclers and scavengers collect 350 tons daily (CCN, 2008). There are over 150 private sector waste operators independently involved in various aspects of waste management, indicating a wider private sector involvement in waste management in Nairobi. 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.

Hazardous waste and healthcare waste is mostly incinerated. However, some of them find their way into dumpsites where they get mixed with municipal waste. None of the urban centres in Kenya operate a landfill. Most of the waste generated ends up in dumpsites where no waste compaction and capping take place. It is estimated that the dumpsite in Nairobi handles 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 in dumpsites, which also pollutes nearby water bodies and land. Combining with other smaller towns, it is estimated that 5.26 million tons of waste are disposed of through open burning and methanation (NEMA, 2005). As there is no source segregation of waste in Kenya, most of the recovery of resources takes place at these dumpsites.

Recycling and composting technologies are very informal and rudimentary and account for a mere 8%. 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 three-fold; accessing appropriate technologies, ensuring quality and finding markets for recycled products. The Table 4.2 below gives a summary of the waste management situation in the country.

Table 4.2: NEMA Statistical Data on Waste Management in Kenya, 2009

<i>Region</i>	<i>Waste handling Mode</i>	<i>No. of Licensed Handlers</i>	<i>Type of Waste</i>
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

In order to respond to the complex challenges of managing waste, two cities are currently developing their Integrated Solid Waste Management Strategies (ISMWS). There are Nairobi and Kisumu with the support of UNEP and UNHabitat respectively. The draft strategies linking poverty and environment are designed to be pro-poor whereby contracting policies and by-laws are developed to support CBOs, youth and women groups to participate in waste management activities.

4.4 ZAMBIA

4.4.1 Institutional and organizational aspects

(a) Local Government (Lusaka City Council)

The Waste Management Unit (WMU) as the regulatory unit of waste management in the City of Lusaka is mandated to plan, organize, execute (directly or indirectly) and supervise waste management services in the City of Lusaka including waste collection from peri-urban and other selected areas in the city and the management of the disposal site. The WMU operates in a cost neutral manner meaning that the WMU shall generate sufficient funds to pay for all the expenditures required to provide an efficient and affordable waste collection and disposal service in the entire city.

In 2003, Lusaka City Council (LCC) produced a Strategic Plan for Municipal Solid Waste Management for the City. Through this plan, two new waste management systems were developed to serve the conventional and peri-urban areas. To support the new waste management system, the LCC elaborated the Municipal Waste Management By-Law. Under this law, all waste generators in the city have to register with their respective waste management companies, utilize their services and pay the corresponding fee. For conventional and commercial areas, LCC entered into partnership with private waste management companies. This has resulted in division of the city into 12 waste management districts. Further, the LCC constructed an engineered sanitary landfill with a life span of over 20 years, being the first of its kind in the country. At present the collection efficiency is for waste in Lusaka is about 40-45%.

The Council has several bylaws relating to waste management however it faces the following challenges:

- (i) Weak enforcement of bylaws
- (ii) Willingness and ability by residents to meet the waste management requirements is low thereby resulting in indiscriminate disposal of waste in the environment.
- (iii) The cost of borrowing for purchase of waste equipment is high. This has inhibited private sector participation in waste management hence there are a few players in the sector to provide the service.
- (iv) Capacity for the local authority is low both in terms of human and financial capacity.

(b) Academia

School of Medicine – Environmental and Occupational Health Department of the University of Zambia (UNZA) is offering a broad range of courses related to waste management.. The curriculum covers various aspects of environmental management such as waste and chemicals management, air and water pollution and environmental impact assessment. The department is also mandated to conduct research on various aspects.

(c) Non Governmental Organizations (NGOs)

(i) Environmental Conservation Association of Zambia (ECAZ)

The ECAZ mandate in relation to waste management is the management of agricultural waste in terms of chemicals, composting of residues and recycling of agriculture waste. In terms of Green House Gases (GHG), the association advocates for control of fires by encouraging fire breaks and early burning. The organization is an affiliate of the Zambia National Farmers Union (ZNFU).

The ECAZ is aware of the risks and impact of waste on the environment and as such the organization undertakes occasional awareness programmes to farmers through field days on environmental safety and other aspects of the environment. ECAZ also encourages people to consume organic products.

(ii) Institute for Solid Waste Zambia Chapter

The mandate of the Institute of Solid Waste (ISW) Zambia chapter is to advocate appropriate waste management practices and enhance practice and training in waste management. The organization draws its membership from organizations involved in waste management in the private and public sectors. The organization ranks the issue of waste management against other perceived needs to be high.

(d) Law Enforcement

The Ministry of Finance and National Development (MFND) is an active participant in the management of wastes through the strict border controls and surveillance undertaken by the Zambia Revenue Authority (ZRA). ZRA, through the Customs and Excise Department, monitors and controls the import and export of goods in conjunction with collaborator personnel from the ECZ at border points such as Chirundu to ensure that no hazardous waste is imported into the country or exported without permission.

The organization ranks the issues of waste management in relation to other perceived needs to be secondary or low. This was attributed to the current global downturn. At the border points, waste seems to be discharged indiscriminately due to non availability of registered dumpsites.

Currently, there is little interaction between customs officers and other institutions at the border point on issues of waste management through institutionalized arrangements or adhoc in sharing information.

(e) Government Agencies

(i) The Environmental Council of Zambia (ECZ)

The ECZ is an autonomous body whose role is to regulate and coordinate environmental management in support of sustainable development in Zambia. This is undertaken through various regulations which include the Waste Management (WM) and Hazardous Waste Management Regulations. ECZ is the national focal point in matters related to the sound management of waste. As the lead agency at the national level, ECZ provides the vital technical competence base for information exchange with international, regional, sub-regional, national and local stakeholder institutions. The institution is also the focal point for the Basel Convention.

The ECZ plays a very critical role of coordinating stakeholders on issues of waste management through adhoc and institutionalized arrangements. It promotes networking by fostering partnerships with stakeholders nationally and internationally such as the Zambia Network for Environmental Educators and Practitioners (ZANEPP) and the Africa Environmental Information Network (AEIN) to mention but a few.

(ii) Radiation Protection Authority

The Radiation Protection Authority is an agency under the Ministry of Health (MoH) and is mandated to enforce the Ionizing Radiation Act to ensure compliance with both national and international practices. The organization ranks the issues of waste management in relation to other perceived needs to be priority. This was attributed to the fact that radiation waste is hazardous and if not properly managed can cause harm to human health and the environment.

(f) Media (Electronic and Print covering environmental issues)

The ECZ is mandated to undertake environmental education and awareness for all stakeholders. The organization monitors carries out training and sensitization programmes for media houses such as the Times of Zambia, Zambia Daily Mail, The Post Newspaper, Zambia National Broadcasting Corporation and several

others. This has resulted in high levels of awareness among journalists in these media houses as indicated by the type of articles captured by ECZ. In 2007 for example a total of 546 articles on environmental related issues from the print media were documented of which 18% were on waste management. This shows a 71% increase from 2006 which recorded 320 articles. The articles range from among others EIA related issues, water pollution, air pollution, waste management, biofuels and climate change.

In order to strengthen networks between the media and newsmakers in the environment sector, ECZ in 2008 supported the environmental newsmaker fora. Two newsmaker fora were hosted in Lusaka and Chirundu. Topics discussed were the *Make Zambia Clean and Healthy Campaign: Challenges and Achievements* and *Chemicals Management at Border Points: a Case for Chirundu* respectively. Various programmes featuring members of staff were aired on Yatsani, Chikuni, Zambezi FM, Sky FM and ZNBC Radio stations. Other programmes were featured on ZNBC and Muvi television stations. There was an increase in the number of environmental issues publicised during the year. Issues relating to EIA, Climate Change and energy dominated press coverage during the year. 7% of all the total articles captured on environmental issues, were on waste management.

Although there is a steady improvement in reporting of environmental issues in the media, there is need for continued training and sensitization among media personnel to equip them with knowledge on emerging issues on waste management some of which include electronic waste.

(g) Agricultural Association

The organization is comprised of companies engaged in the import and distribution of agrochemicals. The mandate is to ensure that all the interests of the agrochemical companies are taken care of. These include training of chemical handlers, provision of after sales service, and compliance with local legislation on pesticides management. Currently none of the members of crop life in Zambia manufacture any chemicals and all therefore rely on import of these chemicals from other countries. Chemicals that are imported in the country are in the original containers from the suppliers.

The organization is aware of the risks that waste resulting from chemical waste and empty chemical containers poses to human health and the environment. To this effect the issue of waste management ranks high among other perceived needs of the organization. This is to ensure compliance with local legislation on chemicals management and promote corporate responsibility.

5 SUMMARY OF THE REGIONAL GAP ANALYSES

In the course of conducting this study on waste management, it has been established that gaps do exist which hamper environmentally sound management of wastes. Measures have to be taken to address them. These issues are in various categories as follows:

5.1 Institutional and Organizational aspects

5.1.1 Policy and Planning

- There is no national policy for reduction of generated waste at source
- Although councils have by-laws, the thrust of these laws has remained focused on collection and disposal of waste, with little official attention being paid to other waste management activities such as recycling and composting. Nonetheless, operationalisation of these laws still remains a big challenge as Kenya still lacks a national Waste Management Policy.
- In some cases Waste Management Strategies developed have not been embraced by all stakeholders in the country.

5.1.2 Legal aspects including enforcement

- Weak enforcement of bylaws in local municipalities
- Most of the existing legislation does not adequately address current key issues and problems of waste risk control and management.

5.1.3 Key stakeholders, their roles and coordination

- There is absence of strong and effective partnership between local authorities and other waste management actors. Integrated Solid Waste Management System therefore becomes necessary.
- It is clear that most organizations have a clear mandate in as far as waste management is concerned. The mandates are understood by all however, these are not fully executed to realize the intended goals.
- Currently, there is little interaction between customs officers and other institutions at the border point of Chirundu on issues of waste management through institutionalized arrangements or adhoc in sharing information and as such there is poor management of waste.
- The extent of interaction between local institutions and policy making bodies is low. There is need for more coordinated efforts.

5.1.4 Capacity building and Training

- The customs officials, who are at the forefront of the country's efforts to combat illegal trade are inadequately equipped to address these challenges.
- There are inadequate financial resources to produce training materials for pesticide users.
- There is low human and financial capacity for the local authorities.
- NGOs have inadequate financial and human capacity to carry out awareness on issues of waste management to farmers all over the country
- Institutions involved in training and research generally require the following:
 - Capacity building in terms of acquisition of latest literature on waste management.
 - Research funds in waste management
 - Upgrade existing laboratories infrastructure in order to bring it to modern standards
 - The need for computers and internet connectivity

5.1.5 Public awareness

- There is a serious gap in awareness creation as the process is considered expensive with no immediate returns. No local authority has adequate budgetary provision to support awareness raising.

- Waste management, is still ranked low in comparison with other competing national development needs.
- There is generally a good level of knowledge and awareness on the risk and impacts of waste among the institutions involved in the study, probably due to good literacy levels, however this may not be true with the general public
- There is lack of awareness on how hazardous waste is treated and disposed.
- There is lack of awareness on issues of waste management among customs officers
- There is unwillingness and ability by residents to meet the waste management requirements thereby resulting in indiscriminate disposal of waste in the environment
- Generally there is poor management of empty chemical containers among farmers, especially small scale farmers

5.1.6 Staff and equipment

- More solid waste human resources and updated equipments have to be availed to African countries.

5.1.7 Finance and cost recovery

- People are generally reluctant to pay the fees of collecting off their municipal wastes.
- Unwillingness and ability by residents to meet the waste management requirements thereby resulting in indiscriminate disposal of waste to the environment
- Cost of borrowing for purchase of waste equipment is high. This has inhibited the active private sector participation in waste management hence there are a few players in the sector to provide the service
- Most institutions lack infrastructure and resources to enforce laws under their jurisdiction. As discussed in (i) above, the work, which the institutions are doing, is not up to acceptable standards because of constraints such as:
 - poor funding
 - poor administration
 - lack of transport
 - lack of equipment, and inadequate remuneration for qualified staff
- There is generally inadequate human and financial capacity for the local authorities to manage waste.
- NGOs have inadequate financial and human capacity to carry out awareness on issues of waste management to farmers all over the country
- There is a steady improvement in reporting of environmental issues in the media however, there is need for continued training and sensitization among media personnel to equip them with knowledge on emerging issues on waste management some of which include electronic waste.

5.2 Waste characteristics

5.2. 1: Types, Sources, and Composition

- Information on types, sources and composition is incomplete and often outdated.

5.2.3: Generation rates and data

- Generally there is lack of data on waste generated hence use of estimates.

5.3 Waste Management practices

5.3.1 Generation

- There is generally low scale of separation of waste at source.
- There is absence of national policy for reduction of generated waste at source.
- Mixing of other waste streams (hazardous waste with domestic) is a common practice.

5.3.2 Collection system

- Generally efficiency of the collection of wastes is low.
- There is insufficient number of suitable containers for waste management.
- Environmentally sound waste management systems are still lacking in most institutions and towns thus waste is discharged indiscriminately

5.3.3 Transportation

- There is inadequate repair and maintenance programs of vehicles' fleet and equipments hence leading to low efficiency in the transportation of wastes
- Transportation of waste is also a major challenge to waste management that consumes in some cases about 30% of a single local authority's revenue. The limited number of vehicles, waste storage bins and personnel lead to only 40% of waste being collected.
- Transportation costs are exacerbated by the routing of vehicles. There is need to increase the number and appropriateness of vehicles for collection and transportation of waste.
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5.3.4 Recycling

There is generally:

- Limited usage and utilization of materials that could be recycled
- Inefficiency in the recycling processes specially for organic waste.
- Lack of technical support to upgrade waste recycling factories.
- Lack of market for some recycled products.
- Lack of institutions which recover and recycle hazardous wastes and empty containers

5.3.5 Recovery

- There is a problem of random sorting by scavengers either in streets, or in waste collection sites and resource recovery from waste in some countries such as Kenya is still low (8%)
- There are few of institutions which recover and recycle hazardous wastes and empty containers.

5.3.6 Incineration

- There is prevalence of spontaneous fires and uncontrolled burning, with subsequent effects on air quality.

5.3.7 Land filling/dumpsites

- There is generally an increase on the demand for spaces for land-filling and countries do lack coherent plans for expansion of secured sanitary land-filling and those that are operational, have not been properly designed, leading to self-ignition of waste with subsequent effects on air quality.
- There is lack of registered dumpsites resulting in indiscriminate disposal of waste (dumpsites) in areas that are not designated for collection or disposal and in the majority of cases there is non-application of technical specifications in such waste disposal ,

5.3.8 Cleaner production

- There is lack of innovative community-level waste management schemes and technologies relating to collection, transportation, recycling and composting of waste
- There is heavy reliance on end-of-pipe solutions, while it is known that the preferred strategy for waste management is source reduction, by which the generation of waste should be reduced to the minimum in terms of quantity and/or hazard potential.. However, more capacity building for local authorities and other lead agencies is still necessary

6. CONCLUSIONS

The main conclusions are organized below as per the international commitment on environmentally sound management of wastes, as reflected in Agenda 21 and the Johannesburg Plan of Implementation.

6.1 Prevent and minimize waste and maximize reuse, recycling and use of environmentally sound alternative materials, with the participation of government authorities and all stakeholders. Among others: encouraging production of reusable consumer goods and biodegradable products and developing the infrastructure required.

- Many African countries have recycling initiatives, especially for paper, PET/plastics, scrap metals and glass. Progress has been made towards formalization of waste recycling in some countries, mostly for industrial waste but also for municipal waste.
- Salvaging recyclable and reusable items from dump sites and waste collection points has and continues to be a source of livelihood for the urban poor.
- Several African countries have started to use organic waste for composting and biogas generation, and this trend is expected to increase. An example of an opportunity with potential replication is the use of agro-residues for energy generation (e.g. bagasse, straw, saw dust, cotton husks, coffee husks etc.) and the application of advanced small scale digesters to produce biogas, fertilizer and/or animal feed.
- Research and development on biodegradable products is ongoing in few African universities (e.g. University of Ghana), but none have been commercialized as of yet
- National Cleaner Production Centres and some other initiatives are working with industries and other organizations to reduce their waste generation.
- The declining availability of landfill space, in particular close to urban areas, is starting to provide an incentive for waste reduction initiatives.
- Some countries have adopted policies to encourage the development of national recycling industries, including for example through export duties on recyclable materials (e.g. Egypt).
- Many countries have started to use waste materials (e.g. demolition waste) as aggregate for the production of construction materials (e.g. bricks, tiles etc.)
- Production of ethanol from some organic wastes (e.g. molasses) is relatively common, and further opportunities become available for other organic waste (e.g. rice straw) and CO₂ recovery from ethanol production.
- Some countries have started to ban the use of specific disposable products, mostly the use of thin film plastic bags.
- There is growing concern about the management of large volume mining wastes (including tailings, slags, etc), and the potential legacies created by their poor management.

6.2 Develop waste management systems and extend waste service coverage. Among others develop and promote integrated management solutions to minimize urban and industrial waste generation and to promote recycling and reuse

- Most African countries have some legislation in regard to waste management, and several have started with integrated waste management strategies to overcome traditional sector approaches.
- Progress in improving waste management systems and extending waste service coverage across Africa remains slow, due to serious capacity, technical and financial constraints.
- Many countries have specific legislation for hazardous waste (including health/medical wastes), and some progress is made in creating appropriate facilities for treatment (including for example incinerators for hospitals and secure landfill). However the capacity to manage hazardous waste is limited, causing widespread disposal of hazardous waste with municipal waste in uncontrolled dump sites.
- Some existing landfills have implemented landfill gas collection and composting, and this has in some cases been co-funded by carbon credits (Clean Development Mechanism).
- Africa still almost exclusively relies on land disposal of wastes, and whilst standards are being adopted for sanitary landfills, most dump sites are not able to meet environmental standards and thereby create a future liability for society and the environment.
- Public private partnerships have been encouraged as a mechanism for implementation of integrated waste management systems.
- Systems for segregation and sorting of municipal wastes at source are not widely available, and recovery of recyclables therefore depends on scavenging at dump sites. Whilst scavenging provides a livelihood for urban poor, it also poses health risks.
- Improving efficiency of recovery and recycling of recyclable materials is critically dependent on further organization and formalization of the recycling and waste management sectors. This would also improve the status of recycling and hence acceptance of waste recycling.

6.3 Ratification and implementation of relevant international instruments on hazardous waste including the Bamako Convention, the fourth Lome Convention and the Basel Convention and its protocol on liability and compensation for damage resulting from the trans-boundary movement and disposal of hazardous waste.

- Most African countries have ratified the relevant international instruments for hazardous waste (including Basel and Bamako) and are at different stages with development and implementation of nation action plans for implementation.
- The absence of specific financial instrument and other means of implementation complementary to the Regional Centres under the Basel convention has hindered full implementation of the Basel convention.
- Only 23 countries had ratified Bamako Convention (by September 2007). The convention prohibits the import of hazardous materials into Africa but lacks means of implementation and so far no conference of parties has taken place.
- Protocol on liability and compensation for damages is still under discussion among the parties.
- The Lome Convention (now known as Cotonou Agreement) is in place but effectively superseded by more recent international agreements, including the Basel convention.
- Most African countries still need to prepare inventories of hazardous wastes and sites potentially affected through inappropriate disposal of hazardous wastes.

6.4 *Preventing international illegal trafficking of hazardous wastes and to prevent damage resulting from the trans-boundary movement and disposal of hazardous wastes in a manner consistent with obligations under relevant international instruments.*

- Management of trans-boundary movement of hazardous waste including illegal trafficking is now governed by Basel and related conventions, which have been ratified and are being implemented across Africa. There is however a need to strengthen trans-border controls and policing of waste transports. Revenue authorities should also be involved in implementation of these agreements.
- There is widespread and growing concern about the growing imports of used consumer goods that contain hazardous materials (e.g. electronic and electric products, cars, medical equipment, pharmaceuticals etc.). The ultimate disposal of these hazardous-materials-container consumer goods poses serious ecological and health threats. Some countries have moved to ban imports of used consumer goods.

6.5 *Global and regional cooperation, including exchange of information and experience and transfer of appropriate technologies to improve the management of radio-active wastes:*

- There is an urgent need to improve the exchange of information on radio-active wastes, including volumes, best practices and storage methods. The IAEA needs to cooperate more actively with African countries on minimization and management of radio-active waste.
- It is expected that nuclear energy might be adopted on a wider scale in Africa in the near future. The management of radio-active wastes of such facilities should be planned as an integral part of developing nuclear energy as part of the energy mix.
- Mining of various minerals is widespread around Africa. The management of radio-nuclides mined either intentionally (uranium) or as by-product (e.g. gold, cobalt etc) is of concern.
- Most African countries import products containing radio-active materials (e.g. medical applications) and the management of the waste thereof is of concern.

6.6 *Support the clean up of sites contaminated as a result of all types of nuclear activity and to conduct health studies in the regions around those sites as appropriate with a view to identifying where health treatment may be needed and should be provided:*

- There is still a need to comprehensively identify site that potentially have been contaminated with radio-active wastes in Africa.

6.7 *Sound management of radio-active waste including:*

- *Sound storage, transportation, trans-boundary movement and disposal of radio-active wastes guided by all the principles of the Rio Declaration on Environment and Development and Agenda 21*
- *Provision of technical assistance to African countries to enable them to develop or improve procedures for management and safe disposal of radio-active wastes*
- *Intensify safety measures with regard to radio-active wastes*
- While African countries acknowledge the importance of sound management of radio-active wastes, the capacity to do so remains still very low across Africa, as only few countries (e.g. Egypt) have given priority to develop and implement comprehensive radio-active waste management systems.

7. RECOMMENDATIONS FOR ENVIRONMENTALLY SOUND MANAGEMENT OF WASTES IN AFRICA

Based on the knowledge available on the continent and the baseline information collected from the four countries namely, Ghana, Egypt, Kenya and Zambia, the following can be recommended in regard to the main international commitments for environmentally sound management of waste, as reflected in Agenda 21 and the Johannesburg Plan of Implementation.

2.1 *Prevent and minimize waste and maximize reuse, recycling and use of environmentally sound alternative materials, with the participation of government authorities and all stakeholders. Among others: encouraging production of reusable consumer goods and biodegradable products and developing the infrastructure required.*

(a) Policy and Planning

- It is important that policies and comprehensive waste and hazardous waste management strategies, (integrated waste management) including basic elements like waste collection, waste treatment, waste recycling, disposal sites, etc. should be in place. These would address recycling of items such as papers, plastics, batteries, lubricating oils and electronic wastes.
- Integrated waste management plans have to support pro-poor involvement in waste management as a source of employment and hence income generation.

(b) Legal aspects including enforcement

- There is a need of strict enforcement of the law and progressively provide for continuous reviews and updates of legislation so as to tailor it to suit, as well as enable it to attain the vital coping mechanisms to deal with new developments and future challenges such as electronic wastes and adopt the principle of extended producer responsibility as it is increasingly practiced in several industrialised countries.

(c) Key stakeholders, their roles and coordination and partnerships

- It is important to enhance the integration and coordination among different concerned parties and the responsibilities of the various agencies involved should be clearly defined to eliminate confusion and effort duplication. The partners should be drawn from Central Government, local authorities, NGOs, the community and industry.
- The current waste management experience demonstrates that formal organizations alone cannot deal adequately with the increasing volumes and complexity and diversity of urban wastes. To address the waste management challenges of the cities through sustained waste recycling, re-use and composting programs, a partnership approach needs an appropriate framework, which clearly lays out responsibilities of each party for effective waste management. This is calling for the development of Integrated Waste Management Systems in urban centres.
- Private-Public Partnerships (PPPs) should be encouraged so that the private sector can set up recycling centres, landfills and incinerators designed in such a way to bring in participation of women and the youth.

(d) Cleaner Production

- The promotion of cleaner production practices, methods, policies and technologies should be done in order to ensure efficient use of raw materials and energy resources whilst minimizing waste generation. There is need at country level to enhance capacity building and create awareness on the importance and benefits of cleaner production

(e) Technologies

- A multi-sectoral plan should be developed to spearhead the development and dissemination of appropriate technologies and practices for environmentally sound management of wastes. This should ensure that all sectors are able to handle their specific wastes without jeopardizing human health and the environment. The Egyptian technology and experience for the conversion lingo-cellulose residues to ethanol for example, should be considered by other countries with large amounts of agro-wastes.
- Application of various waste recovery techniques and technologies such as briquetting, incineration, pyrolysis, gasification and biodigestion should be adopted as economical, efficient, cost effective and environmentally friendly ways of disposing organic wastes.

2.2 *Develop waste management systems and extend waste service coverage. Among others develop and promote integrated management solutions to minimize urban and industrial waste generation and to promote recycling and reuse*

(a) Capacity building and Training

- It is important to promote the on-going training of various stakeholders on environmentally sound management of wastes using the existing institutions. This should also include integrating sound management of wastes into curricula at different schooling levels. Special needs for customs officers and enforcement agencies should be addressed.
- Environmental Agencies and Local Authorities should be strengthened to enhance participation of stakeholders in the implementation of the waste management plans which will address source reduction, reuse and recycling of hazardous waste.

(b) Public awareness

- It is important to mount a strong public awareness campaign on the impact of different types of wastes on human health so as to increase community participation and positive attitude and knowledge on the quantity, type and toxicity of hazardous waste and their environmentally sound management.
- There is a need for continued training and sensitization among media personnel to equip them with knowledge on emerging issues in waste management including electronic waste.

(c) Staff and equipment

- It is important to increase the number of qualified and trained personnel to manage and operate various waste management systems and equipments.

(d) Finance and cost recovery

- It is important to encourage the private sector to take part in investing in waste management systems and issues of high cost of capital should be addressed.
- There should be more funding to NGOs and the media to enable them to play their advocacy roles for environmentally sound management of waste.

(e) Monitoring

- It is important to create special bodies for monitoring, reporting and following up the quality and quantity of waste and their fate.
- There should be regular audits of the quality of emissions of incinerators and other medical waste treatment units.

(f) Waste characteristics

- Generation rates and waste data and characterisation on types, sources and composition of waste has to be improved further because planning for sustainable waste management requires good and reliable national data on generation levels and composition.

(g) Waste Management practices

- It is recommended that segregation of waste components from the point of generation should be done with the establishment of transfer stations with suitable capacity and stockpiles of all crushed materials should be stored in separate and secured designated storage areas to avoid contamination or deterioration by weathering.

(h) Collection system

- Efforts should be directed towards increasing the collection efficiency of all types of wastes and their collection and transportation services, but there should be strict control of the handling of special or hazardous wastes (e.g. chemicals, medical wastes) and prohibit its recycling or reuse.

(i) Transportation

- It is important to develop a transportation system to transport various waste streams from rural and urban areas to suitable disposal and treatment facilities.
- There is need to increase the number and appropriateness of vehicles for collection and transportation of waste. Further, local authorities should consider the use of Geographic Information Systems (GIS) and Remote Sensing (RS) to improve waste mapping and assist effective collection and transport.

(j) Recycling

- It is important to introduce appropriate incentives to promote the usage of recycled, recyclable and/or biodegradable items for daily use, including for example recycled paper bags and biodegradable plastic bags.
- Wastes containing metals such as steel, copper and aluminum should be sold to factories in order to be recycled in producing new metals and all construction and demolition wastes such as bricks, concrete, stone and marble should be crushed on site to a uniform quality of adequate grading in order to maximize their reuse as recycled aggregates and filling materials.
- It is important for NGOs and local authorities, to support the creation of regional networks which promote waste recycling and reuse.
- Waste management operations would benefit greatly from the development and implementation of national policies on solid waste management that criminalize inappropriate waste management, including for example incineration or land filling of recyclables and compostables.

(j) Recovery

- Promotion of the production of compost should be enhanced and suitable enabling systems and techniques developed and disseminated for affordable collection and transport of organic waste from farms and other sources.
- Where feasible, the scope of agriculture waste reuse or recycling by using it as source of energy, briquetting, composting, biogas production, ethanol production and animal fodder should be explored.

(k) Incineration.

- It is important to ensure all hospitals and other medical facilities can dispose of their medical wastes in properly equipped incinerator or autoclave/shredding system which can handle such waste in an environmentally sound manner.

(l) Land filling/dumpsites

- Disposing of wastes should be carried out in controlled landfills to prevent any contamination to water and soil.
- Selection, design, construction and operation of landfill sites should take place within proper environmental management systems in order to protect the environment during the whole lifespan of the landfill.
- There has to be continual rehabilitation of the controlled dump sites and methane capture should be put in place.
- There should be strict control of the handling of medical and other hazardous waste and prohibit its recycling or reuse.

2.3 Ratification and implementation of relevant international instruments on hazardous waste including the Bamako Convention, the fourth Lome Convention and the Basel Convention and its protocol on liability and compensation for damage resulting from the trans-boundary movement and disposal of hazardous waste.

(a) Ratification

- It is important for the rest of African countries that have not yet ratified the relevant international instruments for hazardous waste (including Basel and Bamako Convention) to do so as to speed up the development and implementation of nation action plans for implementation.

(b) Financial instruments

- Appropriate financial instruments and other means of implementation complementary to the Regional Centres under the Basel convention have to be put in place to accelerate the implementation of the Basel convention.

(c) Bamako Convention challenges

- Challenges around the ratification and eventual implementation of the Bamako Convention have to be addressed at various Africa Union fora.

(d) Protocol on Liability and Compensation of the Basel Convention

- Challenges around the non-ratification of the Protocol on liability and compensation for damages have to be addressed among the parties.

(e) Inventories of Hazardous wastes

- It is important that African countries prepare inventories of hazardous wastes and sites potentially affected through inappropriate disposal of hazardous wastes to enable targeted national and international remedial actions.

2.4 Preventing international illegal trafficking of hazardous wastes and to prevent damage resulting from the trans-boundary movement and disposal of hazardous wastes in a manner consistent with obligations under relevant international instruments.

(a) Regional Cooperation

- In order to manage trans-boundary movement of hazardous waste effectively including illegal trafficking there is a need to strengthen trans-border controls and policing of waste transports through strengthening cooperation with neighbouring countries. Revenue authorities should also be involved in implementation of these agreements.

(b) Hazardous wastes of concern

- Used consumer goods that contain hazardous materials (e.g. electronic and electric products, cars, medical equipment, pharmaceuticals etc.) are becoming an issue and pose serious ecological and health threats. There is hence a need for concerted efforts at a regional and international level to prevent and minimize these concerns.

2.5 Global and regional cooperation, including exchange of information and experience and transfer of appropriate technologies to improve the management of radio-active wastes:

(a) Exchange of information

- There is an urgent need to improve the exchange of information on radio-active wastes, including volumes, best practices and storage methods. The IAEA needs to cooperate more actively with African countries on minimization and management of radio-active waste.

(b) Energy mix option

- The management of radio-active wastes of such facilities should be planned as an integral part of developing the energy mix.

(c) Management in an environmentally sound manner

- The management of radio-nuclides mined either intentionally (uranium) or as by-product (e.g. gold, cobalt etc.) has to observe environmental safeguards. This equally applies to imported products that contain radio-active materials (e.g. medical applications) and the management of the waste thereof.

2.6 Support the clean up of sites contaminated as a result of all types of nuclear activity and to conduct health studies in the regions around those sites as appropriate with a view to identifying where health treatment may be needed and should be provided:

- It is important to comprehensively identify sites that potentially have been contaminated with radio-active wastes in Africa.

2.7 *Sound management of radio-active waste including:*

- *Sound storage, transportation, trans-boundary movement and disposal of radio-active wastes guided by all the principles of the Rio Declaration on Environment and Development and Agenda 21*
- *Provision of technical assistance to African countries to enable them to develop or improve procedures for management and safe disposal of radio-active wastes*
- *Intensify safety measures with regard to radio-active wastes*

While African countries acknowledge the importance of sound management of radio-active wastes, the capacity to do so remains still very low across Africa, as only few countries (e.g. Egypt) have given priority to develop and implement comprehensive radio-active waste management systems.

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