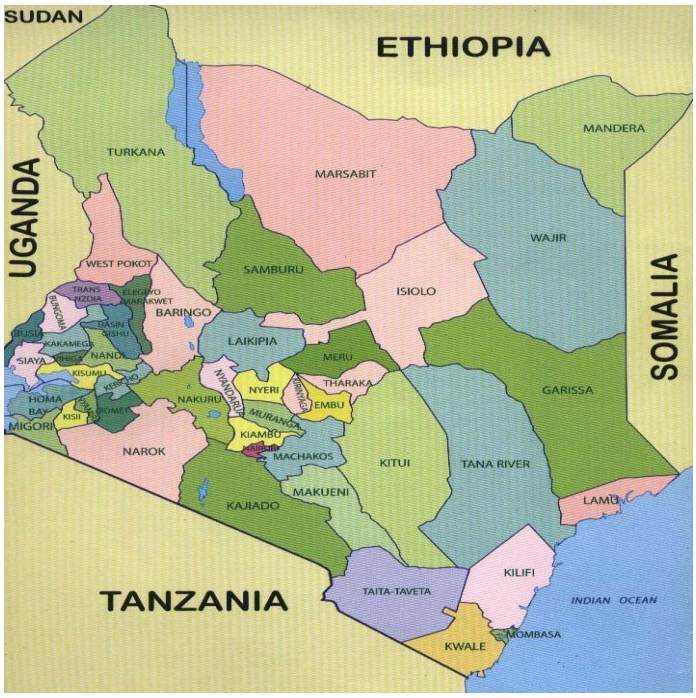
Republic Of Kenya

Ministry Of Environment and Mineral Resources

KENYA NATIONAL PROFILE TO ASSESS THE CHEMICALS MANAGEMENT



Kenya Counties

August, 2011

The project "Strengthening Capacities in Kenya for National SAICM Implementation" was developed with the technical assistance of the United Nations Institute for Training and Research (UNITAR) and the financial support of the Strategic Approach to International Chemicals Management (SAICM) Quick Start Programme Trust Fund.

FOREWORD

Hon John N Michuki EGH,MP
Minister for Environment and Mineral Resources

Chemicals play a key role in many aspects of human development in Kenya. They are vital inputs to sustainable development, medical products that save lives and increase life expectancy, pesticides and fertilizers that tremendously increase agricultural productivity. Thus, chemicals influence virtually all human activity and yet they also are a risk to humans. Management of risks posed by chemicals should therefore be addressed in a coherent way, at individual, local, national and global levels. We need to address the socio-economic advantages of chemicals as well as the risks they pose to human health and the environment.

The Government of Kenya recognizes the Johannesburg Plan of Implementation as adopted at the World Summit on Sustainable Development in 2002 that set the goal to ensure the sound management of chemicals world-wide by 2020. During the first International Conference on Chemicals Management held in February 2006, the world community adopted the Strategic Approach to International Chemicals Management (SAICM) tool to achieve this goal. Kenya has chosen to adopt SAICM as the standard tool for addressing the risks posed by chemicals. SAICM also comes to augment the Sessional Paper No. 6 of 1999 on Environment and Development.

Kenya is in the process of establishing a policy and regulatory regime for chemicals and will therefore require an understanding of its chemicals profile on the status of chemicals produced, transported, used and disposed in an environmentally sound manner on becoming waste. It is therefore critical for Kenya to understand the nature of chemicals used within Kenya and those on transit in Kenya, their hazards and the risks they pose. It is in this context that under the guidance of the United Nations Institute for Training and Research (UNITAR), Kenya has prepared this National Chemicals Profile (NCP), aimed at assessing how Kenya has developed the national infrastructure for legislation, coordination and management of chemicals and their waste and set new targets for capacity building.

It is expected that the development of NCP will lead Kenyan institutions to improve coordination in risk management among governmental and non-governmental organizations common targeted action plans. These include phase out of leaded gasoline, persistent organic pollutants, controlled substances such as ozone depleting substances and introduction of alternatives to toxic chemicals. I therefore wish to take this opportunity to thank all those involved in its development, the financial support from the SAICM Quick Start Trust Fund, and the United Nationas Institute for Training and Research for the technical support given to my ministry in preparation for this Kenya's first National Chemicals Profile.

Hon. John Michuki CBS
Minister of Environment and Mineral resources

M**ohamed Ali Daud**
Permanent Secretary

As a step towards the implementation of Strategic Approach to International Chemicals Management (SAICM), Kenya has developed this National Chemicals Profile (NCP). It reflects Kenya's existing infrastructure and capacities for managing chemicals. It includes information on legal, institutional, administrative and technical aspects of chemicals management presenting Kenya's capability and preparedness for SAICM implementation. It has identified existing strengths, gaps and weaknesses at the national regional levels. It is expected to serve as an important reference document for strengthening chemicals management in Kenya and meeting commitments to mainstreaming chemicals management into Kenya's national development processes as well as meeting Kenyas sustainable and millennium development goals.

This ministry appreciates the work of the interdisciplinary and inter-ministerial team that developed this profile. It carried a situation analysis which provided an understanding of chemicals related activities that are planned or are underway in Kenya. It addressed how decisions are made and what facilities exist that oversees feed into chemicals risk management activities.

Based on this it has been possible to identify the problems, causes and contributing factors that pose challenges to human health and the environment that should be addressed. It provides information on the key ministries/agencies in the field of chemicals management, their respective mandates, the type of activities they undertake and existing coordination mechanisms. The next step is to determine the elements of inter-ministerial coordination of chemicals management, priority actions addressing international commitment, awareness raising and emergency preparedness.

Implementation of the recommendations of the profile has already started with NEMA commencing formulation of chemical regulations. This will address the lifecycle of chemicals from imports, transport, use and disposal when they become waste.
The Ministry will ensure that chemicals management is mainstreamed in all development activities and is pleased to have involved the key stakeholders in chemicals management in developing this profile as a first step and will fully commit itself to developing inter-ministerial coordination, SAICM policy and its implementation action plans.

Mohammed Ali Daud
PERMANENT SECRETARY

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EXECUTIVE SUMMARY

Chemicals contribute to the social economic development of Kenyan population of 38.6 million. In order of importance agriculture, manufacturing and provision of services are the major producers and consumers of chemicals. Services which include energy generation, transport, whole sale trade and related acrtivities contribute 62 % of the Kenya domestic product. As a group services are the major consumers of diverse chemical inputs such as petroleum, consumer chemicals etc. As a block, agriculture dominates Kenya's economy accounting (with forestry and fishing) for about 24 % of GDP, followed by manufacturing with 13%. In terms of diversity and complexity in the type of activities and employment, the informal sector domination is is large and growing. Currently it employs about 40% of the labor force and uses chemicals in the small industries as well in widespread services such as petrol stations, beauty parlors, drycleaning etc. The informal sector contains organized small-scale and unregulated activities that use chemicals and where the risks of toxic chemicals and wastes on human population and environment are mostly manifested.

This Kenya report documents the profile of chemicals life cycle in Kenya profiling production, import, export, transport, storage, use and disposal of chemicals. Appreciating that chemicals present a risk to human health and the environment, it It gives a summary of the quantities and types of the chemicals producesd imported and used as well as the governace of chemicals, technical and economic issues related to managing risks posed by chemicals. This is detailed in thirteen chapters with conclusion and recommendations in the fourteent chapter.

Chemical Production, Import, Export and Use

Kenya is not a major producer of synthetic chemicals. However there is extensive extraction of mineral chemicals. In terms of volume and quantity, the major ones are soda ash, sodim chloride fluorspar, carbon dioxide, diatomite are currently being mined and plans for largescale titanium minining. Highly toxic chemicals are not produced significantly in terms of quantity. But ethanol, methanol is. Agrochemicals, petroleum, petrochemical products and industrial chemicals are mostly imported and some re-exported. In total chemicals account for 6% of the gross domestic product in while in terms of dispersal agriculture, transport, services and energy sectors use petrochemical and petroleum products widely thus generating and disposing chemicals as waste widest in service stations, garages, power generation burning fossil fuels, batteries, oil, refrigeration/metal treatment etc.

Priority Concerns Related to Chemical Production, Import, Export and Use

Chapter three reviews concerns of production, import, export and use. The import and export of chemicals account for the highest exposure through handling, transport and potential for dumping of banned and restricted chemicals destined for Kenya neighbouring countries of Uganda, Rwanda, Burudi, Southern Sudan, Somalia and Ethiopia. There have been accidents during the import and export activities. There have been several documented cases of poisoning in industries, farms and in alcohol abuse which account for the highest fatalities. This calls for measures to reduce risks posed by chemicals through legal and technical means

Ministries, Agencies and Other Institutions Managing Chemicals

Chapter four, five and six profile the governance structures for managing risks posed by chemicals provided by the Kenya Government and stakeholders. A number of public and private institutions have established or are providing mechanisms and instruments for chemicals safety. Those institutions mandated to address various aspects of risks in chemicals life cycle are largely guided in policy by relevant Ministries but executed by spcecialised institutions such as the Government Chemist Department. Similarly Pest Control Product Board, Water Resources Management Authority, National Environment Management Authority, Occupational Health and Safety Department, Kenya Medical Research Institute, Kenya Plant Health Inspectorate Service, etc. have sector specialization providing forensic and general analysical services, surveillance and means of enforcing risk reduction measures. They consult and promote synergy on issues common to their mandate. Outside the government industry, international community and special interest groups supplement government effort because issues of chemicals and hazardous wastes re generally sufficiently complex as to raise

considerations that go far beyond the environmental capability of governmeent. These diverse groups are cross-sectoral and led by industry which is involved in the production and marketing of chemicals, and bear the biggest responsibility for meeting the cost of protecting the environment and human health ro chemical risks.

Inter-ministerial Commissions and Coordinating Mechanisms

Chapter six is a profile of chemicals management framework laws and regulations on industrial chemicals, pesticides and environment management tools that include health, safety, physical planning, waste management, water, etc. The commissions and mechanisms are expected to bring coherence and harmoniy in an otherwise very random sector. This is because there are other laws and regulations of a general nature with an impact on chemicals management such as in import and export, transport. They facilitate coordination among ministries, address issues of overlap, publicity and potential conflict, mediate and resolve conflicts on mandate. More importantly, they provide forum for policy dialogue, serve as a network for information exchange and consultation. Such forums largely work in an environment where data and information is available.

Data Access and Use

Chapter seven recognizes that if information gathered is not disseminated then the cost of gathering such data is wasted. There are ongoing programmes that collect data and information on chemical impacts in facilities, environment, health and work safety. It has been observed that institutions dealing with chemicals and chemical related programs are not maximizing the benefits of the data they collect. Data becomes obsolete fragmented and inaccessible to users. Effective information systems for chemical users are an important means of ensuring that chemical poisoning and environmental pollution due to misuse and mishandling does not occur. This is only be possible through the cooperation of various governmental agencies, industries and concerned citizens which it lacks. The most common form of information dissemination is currently distribution of printed material United Nations specialized agencies commonly refred as the Intergovernmental Organizations for the Sound Management of Chemicals. Locally with the exception of public and institutional libraries very few other institutions keep data on chemicals in an organized easily retrievable form. However there is effort to to maximize on internet and institutional websites as sources of information and knowledge. The lack of data and information is attributed to lack of capacity and infrastructure for monitoring, surveillance, lresearch and documenting enforcement.

Chapter 8 is a review of existing infrastructure.

Technical Infrastructure

There are many institutions handling issues of chemical risks. Many have well trained manpower thay collect valuable information but are ill equipped to receive, analyse and disseminate it. Many now have online service and to receive and distribute information. The Pesticides Control Product Board and its partners in Agrochemical Associuation of Kenya for agrochemicals, Petroleum Institute for East Africa and th e Kenya Manufacturers Association. In all these institutions, although there is no mandate conflicts but overlap in collecting data such as water and food contamination. There is no capability on data on air medium. There is high activity in research, data collection and analysis.Kenya institutions have high qualified manpower. Their engagement and utilization is not clearly maximised. There are issues of manpower needs and staff requirements and the country needs policy guidance on matters of staff training, financial requirements, action plans, coordination and partnerships

Awareness and Understanding of Workers and the Public

Frequency of incidences of worker exposure to chemicals is the greatest indicator of risks posed by chemicals. Worker safety issues are best manifest in agriculture and industry. In this connection, workers need to be educated on the dangers they are exposing themselves to when handling chemicals in all places where chemicals are used. The management and the technicians could be sensitized to ensure that the less skilled workers handling chemicals take the necessary safety precautions to protect themselves from the exposure by using protective personnal protective equipment and

clothing. This would enhance understanding of the risks associated with chemical use and handling at the work place. Fortunately, the estamblishment of health, safety and environmental committees in work places is now well entretched practice and could be used to enhance chemical risks reduction. In addition regular inspections currently practiced and and the presence of Environment Health and Safety Officers in many provinces is now an accepted management enterprise policy in nearly all formal enterprises.
Violence and unpredictability of chemicals is manifested by their flammability, explosiveness, reactivity and toxicity. When they occur, it is an emergency to control the rate of reaction to avoid disaster. The preparedness of chemical disasters is inadequate. As Chapter 10 indicates, loss of life and property is frequent judging from of accidents and incidents of explosions, fires, and poisonings. The profile indicates dire need for fire risk preparedness and capacity to develop rescue plans for chemical incidents.

Kenya has very intense international linkages. Being the host country of the United Nations Environment Program, it is closely involved in UNEPs chemicals and harmful substances and waste agenda, especially the international commitments negotiated under the chemicals and waste cluster. Chapter 12 details the institutions and the processes that Kenya is involved in; importance is the availability of financing mechanisms for addressing capacity building needs to address chemical risks. It concludes that adequate financing chemicals and waste programme can greatly reduce chemical risks as currently institutions addressing such risks are poorly funded. The financial needs for capacity building for human and technical resources are detailed in chapter 12.

Conclusions and Recommendations

It highlights strengths, gaps and identifies priority areas which could have the greatest immediate impact on chemicals risk reduction in Kenya. In its development, there have been active participation and contribution from key chemicals stakeholders' such as the government, civil society, industry, academia, research among others. They provided valuable input.

It is expected that its development will lead Kenyan institutions to improve coordination among all key governmental and non-governmental organizations targeted action plans. These include phase out of leaded gasoline, mercury, persistent organic pollutants, controlled substances such as ozone depleting substances and introduction of alternatives to toxic chemicals.

Chapter fourteen, the National Profile contains specific recommendations and priority actions.

ACRONYMS AND ABREVIATIONS

AAK	Agrochemicals Association of Kenya
AAS	Atomic Absorption Specrophotometer
CBOs	Community Based Organizations
CIN	Consumer Information Network
CIEN	Chemicals Information Exchange Network
COMESA	Common Market ro Eastern and Southern Africa
COYA	Company of the Year Award
CBO	Community Based Organisation
CSOs	Civil Society Organizations
DIT	Department of Industrial Training
DOHSS	Department of Occupational Health and Safety Services
EA	Environmental Audits
EAC	East African Community
EIA	Environmental Impact Assessments
EMCA	Environmental Management and Coordination Act
FAO	Food and agriculture Oerganisation
FKE	Federation of Kenya Employers
GCD	Government Chemist Department
GEF	Global Environment Facility
GMP	Global Monitoring Programm
GoK	Government of Kenya
GHS	Globally armonised System of Classification
GHG	Greenhouse Gas
ICT	Information Communication Technology
ICIPE	International Centre for Insect Physiology and Ecology
IPCS	Integrated Programme on Chemicals safety
ILO	International Labor Organization
JPOI	Johannesburg Plan of Implementation
JKUAT	Jomo Kenyatta University of Agriculture and Technology
HPLC	High Performance Liquid Chromatography
KARI	Kenya Agricultural Research Institute
KEBS	Kenya Bureau of Standards
KEFRI	Kenya Forestry Research Institute
KEMRI	Kenya Medical Research Institute
KEPHIS	Kenya Plant Health Inspectorate Services
KIRDI	Kenya Industrial Research and Development Institute
KNCPC	Kenya National Cleaner Production Centre
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
MEA	Multilateral Environmental Agreement
MEMR	Ministry of Environment and Mineral Resources
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOIC	Ministry of Industrialization
MOLG	Ministry of Local Government
MOL	Ministry of Labour
MOMS	Ministry of Medical Services
MOPHS	Ministry of Public Health and Sanitation
MOT	Ministry of Trade
MOWI	Ministry of Water and Irrigation
NEMA	National Environment Management Authority
ODS	Ozone Depleting Substances
PIC	Prior informed Consent
PEAP	Provincial Environment Action Plan
PEC	Provincial Environment Committee
PCBs	Poly-chlorinated Biphenyls
PCPB	Pest Control Products Board
POPs	Persistent Organic Pollutants
SANA	Situational Analysis and Needs Assessment
SAICM	Strategic Approach to International Chemicals Management
SOE	State of Environment
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial development Organisation
UNITAR	United nations Institute For Traininf and Reserach
UN-WSSD	United nation World Summit on Sustainable Development
UoN	University of Nairobi
WARMA	Water Resource Management Authority
WTO	World Trade Organisation
WHO	World Health Organization

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1 CHAPTER 1: NATIONAL BACKGROUND INFORMATION

1.1 National Background Information

The Republic of Kenya is located on the East Coast of Africa. It lies on the equator and is bordered on the north by Sudan, Somalia and Ethiopia; Uganda and Lake Victoria lie to the west; Tanzania is to the South while the Indian Ocean lies to the east. It has a total area of 585,363 square km of which 571,416 square km is the dry land, 11,230 square km is occupied by lakes and 2,717 is exclusively the sea territorial area. It is the world's 47th largest country. Kenya has 42 ethnic groups with adapted cultures, traditions, and practices influenced largely by climate land productivity, and biodiversity. These diverse cultures have in turn adapted lifestyles to their needs to survive and protect their resource heir t base. Figure 1 shows the main features of Kenya. In August 2010, Kenya got a new constitution.

Table 1.1 below gives a summary of the key physical and demographic aspects of Kenya.

Size: **585,363 Sq. Km***
Official Languages: **English, Swahili***
Local Languages: **42 –Swahili is National Language***
Total Population: **38.6 Million (2009 Census)**
Urban Population: **32.3% (under city, municipality or Town Council)**
Rural Population: **67.7%**
Population between 0-14 years: **42.9%**
Birth Rate: **36.64/1000 Population (est 2009)**
Life Expectancy: **54.5 Years**
Average Education Level Of Population: **Secondary school***
Unemployment Rate **60%***

Table 1.A Physical and Demographic Context

Source: *GoK Facts and Figures 2009, Kenya 2009 Population and housing census

1.2 Socio Economic Situation

Kenya, like most developing countries, continues to face major challenges in the 21st Century. These include persistent and increasing poverty decline in productive sectors, unemployment, and deficient infrastructure. This situation has led to increased poverty where over 56%[1] of the 38 million Kenyans are estimated to be living below the poverty line. This situation calls for macro-economic policies which provide for a stable economic environment fostering business confidence; encourage a vigorous industrial sector and the development of human capital.. This would lead to an increase in demand for chemicals in both production and consumption which would subsequently lead to an increase in waste generation that is chemical by nature, and its associated treatment and disposal. Accumulation of these chemical pollutants in the environment is a health hazard and a threat to the markets where the products are exported. Misuse of chemicals is also Kenya's concern because of negative environmental and health impacts.

- 70% of the population live in rural Areas and 60% are involved in agriculture
- 27% urban and almost 60% live in informal settlements.and engage in the informal sector employment characterized by small streams of highly toxic and hazardous wastes

[1]GOK: Economic profile, facts and figures 2009

- Growth is currently 8% due to industrialisation and provision of services. Net effect is generation of waste sold liquid, gases.
- Nairobi,Thika, Mombasa,Nakuru, Kisumu Eldoret and Mavoko have the highest populations and the highest incidences of environmental pollution

1.2.1 Administrative Structure

In August 2010, Kenya adopted a new constitution which ushered in a new administrative structure under this new structure; Kenya has been divided into 47 administrative counties. Fig2. Which are further divided into districts currently 210, which are the basis government services. They are headed by District Commissioners. These are then sub divided into divisions and locations headed by a district officers and chiefs respectively.

The central government implements its policies through these administrative structures with funds allocated during national budgets and voted for by parliament. In addition to these administrative structures, there is Local government structure that deals with the delivery of services to the urban locations. It comprises of the city management, municipality and county council and is headed by the Minister for Local Government. The local governments can make by-laws specific and relevant to their economic, geographic and social situations of the region under their jurisdictions. The cities and municipalities are headed by a mayor and councilors while town and urban council are headed by chairmen who work with councilors. They key local authorities are the City Councils of Nairobi, Mombasa and Kisumu, and the Municipalities of Nakuru and Eldoret.

1.2.2 Population of Urban Centers

The high rate of urbanization in Kenya is associated with high rates of solid waste generation. Rapid urbanisation, fuelled by both natural growth and rural-urban migration, has strained the capacity of Kenyan cities to provide critical services to urban residents. It is estimated that 34.8% (i.e., 10 million) of the total population of Kenya resides in the urban centers, with the largest five cities (Nairobi, Mombasa, Kisumu, Nakuru, and Eldoret) accounting for a third of the urban population. The most recent UN estimates suggest that Kenya's urban population will expand to 38 million by the year 2030, accounting for 62.7 percent of the national population. [2]According to these projections, the annual urban population growth rate is expected to average 5.2 percent from 2000 to 2010, 4.2 percent from 2010 to 2020 and 3.2 percent from 2020 to 2030.

While the exact rate of urbanisation may be disputed, the trend is incontrovertible; within 20 years or so, the majority of the Kenyan population will be living in urban areas. The scale of future urbanisation will pose further socio-economic, environmental and institutional challenges for Kenyan cities. The Government's launch of its *Vision 2030* highlighted rapid urbanisation as one of four key challenges for the country alongside income inequality, unemployment and low savings.

[2] Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2004 Revision and World Urbanization Prospects, 04 December 2006; 1:44:13 PM.

The size of a municipality population is significant because it can serve as an indication of the size of industrial, agricultural, and other services which are likely to use chemicals. Table 1 summarizes the administrative locations and populations of counties. County governments will be responsible for implementing policies of devolved government. In addition to these administrative structures, there is Local government structure that deals with the delivery of services to the urban population. It comprises of the city management, municipality and county council and is headed by the Minister for Local Government. The local governments can make by-laws specific to economic, geographic and social situations of the region under their jurisdictions. This may involve the enterprises and services in such areas.

The local authorities although financed by a local Government allocation from the central government are distinct entities. The cities and municipalities are headed by a mayor and councilors while town and urban council are headed by chairmen who work with councilors. They key local authorities are the City Councils of Nairobi, Mombasa and Kisumu, and the Municipalities of Nakuru and Eldoret.

1.2.3 Population in Counties

Kenyas 47 counties have diverse chemiaacl concerns.The size of a county population is significant because it can serve as an indication of the size of industrial, agricultural, and other services which are likely to use chemicals and generate waste.

To assess concern the regions where the counties lie were visites and consulations held with stakeholdes. Their views are in Chapter 3.

Annex 1 is population of counties as per 2009 census.

1.3 Industrial, Agricultural and other key economic sectors

The major contributors to Kenyas Gross Domestic Products are services, agriculture and industries among others.

Table 1.2 gives the summary of Kenya's population growth and GDP for selected economic indicators for the period 2000 to 2009.

Table 1.2 Growths of the Agriculture, Manufacturing, Services and the Informal Sector, 2008

Criteria/Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Population (millions)	30.4	31.3	32.2	33.2	34.2	35.1	36.1	37.1	38.3	38.6
Share of agriculture (GDP %	28.4	27	24.9	24.6	23.7	23.8	23.4	21.6	22.7	24.4
Share of Manufacturing in GDP (%)	10.3	9.7	9.8	9.6	9.9	10.5	10.3	10.4	10.6	9.5
Share of services in GDP (%)	8.9	9.6	10.1	9.9	10.3	10.3	10.6	10.6	10.2	10.1
Fishing	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4

Source: CBS Statistical Abstracts, 2009

Table 1.3: Overview of the Industrial, Agricultural and Mining Sectors (2007)

Sector	Contribution to GDP (%)	No. tonnes ('000)[3]	Major products in each sector
Industrial/ manufacturing	10.6	264,095	Paints, Lacquers and Pigments , Agro industry Metals (extraction, mining) Furniture wood,Paper printing and Publishing, Textile garments and Leather
Mining	0.7	6,530	Soda ash, Salt, diatomite, Fluorspar, titanium.
Agricultural	23.4	340,714	Coffee, Horticulture, Sugar, Fishery, Livestock,
Fishing	0.4	400	Ocean and coastal fishing Inland water fishing
Total	35.1	597.5	

Source: CBS Statistical Abstracts, 2009.

1.3.1 Industries

Industries or manufacturing accounted for 18.7% of the GDP in 2006/2007 making industrialization the quickest means for generation of employment and value addition to natural resources. The main manufacturing enterprises (both large and small) are users of chemicals and represent an estimated 6% of the GDP. They include: tanneries, textile dyeing plants, dyestuff producers, metal working and electroplating shops.

Table 1.4 Breakdown of Industrial Production by Region

Region	Major Products
Central	Sulphuric acid, fertilisers, Plastic and leathers shoes and apparels, plastic products, Vehicle parts, galvanized sheets, metal products
Coast	Petroleum Products, Cement, Plastic and leathers, plastic products, Vehicle parts, galvanized sheets, metal products
Eastern	Detergents, cement, ceramics, print material, textiles, galvanized sheets, leather, alcohol and spirits, meet
Nairobi	Basic chemicals, petroleum products, cement, glass, ceramics, plastic and leathers shoes, plastic products,galvanized sheets, metal products
North Eastern	None
Nyanza	Sugar, ethanol, bakers yeast, lime, P.V.C products, plastic products
Rift Valley	Soda ash, Fluorspar, textiles, sugar
Western	Pulp and paper, sugar, Sulphuric acid , , detergents

Source: Central Bureau of Statistics: Statistical Abstracts, 2007

[3] These figures do not include those in the informal sectors or those employed on a casual basis

Table 1.5 Industrial Employment by Major economic Sectors

ISIC CODE	SECTOR	No. Employed
1	Agriculture (farm and processing)	340,714
2	Textiles	34,895
3	Wood products (Pulp)	4,663
4	Paper (Pulp and paper wastes)	8,593
5	Chemicals (inert gases, oxygen and nitrous oxide)	14,649
6	Non metal (CO_2, SO_2, Nitrates)	3,138
7	Basic metals (iron)	5,557
10	Manufacture of electrical machinery and appliances	3,024
11	Ship building and repairing	469
14	Motor vehicle Manufacture and Assembly	2,813
15	Aircraft manufacture and repair	118
17	Mining and Extraction	6,530
18	Dry Cleaning	154[4]
19	Electricity Generation(thermal, geothermal)	10,560

Source: Central Bureau of Statistics: Statistical Abstracts, 2007

Table 1.7 is the detailed distribution f employees by specific manufacturing types.

Table 1.6 Type of manufacture	**No. of Employees**		
	19 – 49	**>49**	**Total**
Tanners and Leather finishing	42	42	84
Manufacture of footwear	793	900	1693
Manufacture of pulp, paper and Paperboard	1503	1869	3,372
Manufacture of basic industrial Chemicals except fertilizers	812	1085	1897
Manufacture of paints, vanishes Lacquers	862	2517	3379
Manufacture of soap and Cleaning operations	1584	2920	4,504
Manufacture of chemical products	1499	591	2090
Petroleum refineries	246	-	246
Manufacture of plastic products	1578	6459	8o37

1.4 Agricultural Sector

Agriculture's contribution to GDP increased from 23.4% in 2008 to 24.4 percent in 2009 (Table 2.1). However, the sector's performance declined in 2009 with a smaller margin of 2.6% compared with -4.1% in 2008. Agricultural sub-sector uses large quantities of fertilizer and is the main user of pesticides.

[4] There is yet a correct inventory of dry cleaning facilities

Table 1.7 Breakdown of Agricultural Products by Regions, 2008

Region	Major Crops	Size of High Potential Productive Areas (# of hectares)
Central	Tea, Coffee, Horticulture, potatoes,	909
Coast	Fruits, Sisal	373
Eastern	Coffee, tea, milk, horticulture	503
Nairobi	Horticulture	16
North Eastern	None	-
Nyanza	Sugar, tea, milk, bananas, coffee	1,2178
Rift Valley	Maze, Tea, flowers, wheat	3,025
Western	Maize, sugar	6,785

Source: Central Bureau of Statistics: Statistical Abstracts, 2009

The main agro-based industries utilizing significant amounts of chemicals are: horticulture coffee, leather industries, pulp and paper, pyrethrum industry.

a) Coffee Industry.

Coffee processing is a major industry in Kenya. There are about 100,000 hectares under coffee in Kenya of which 30,888 hectares are plantations and the rest small-scale under cooperatives. Many estates have own factories while cooperatives have joint factories. In total, there are about 1,200 coffee factories, located near streams and rivers. In 2008, 61,225 tonnes of coffee were produced (Government of Kenya (3) 2009). Coffee farming is a major user of fungicides and insecticides .The solid wastes (pulp & husks) are reused and recycled to produce manure and briquettes respectively. Chemicals are used on the farm to control pests especially copper oxy chloride manufactured from crap copper. In the past, copper oxy chloride used to be manufactured locally but this has since stopped because of environmental concerns of discharging effluent high in copper. However there are unconfirmed reports that the informal sector still illegally produces the fungicide.

b) Tea Industry

Tea has been Kenya's leading export commodity accounting for about 24% of export earnings in 2003. Tea industry is a major source of employment with over 2 million people in direct tea farming, manufacturing, and marketing and indirectly in retail outlets and transportation. In 2007, tea production was 293,670 tonnes. Out of this 262,175 tonnes were exported.(Government of Kenya (3) 2009). The major environmental impacts caused by the tea sector are oil pollution from diesel oil reception facilities, fertilizers in farming activities and also management of waste oil from the large fleets of vehicles as tea factories are major users of furnace oil to dry the tea but are now increasingly turning to wood and reducing reliance on heavy diesel. Focus will now be on how they are able to control air pollution.

c) Sugar Industry

Kenya currently produces about 70% of her domestic consumption. There are six registered sugar factories with annual production capacity of 550-600,000 tonnes and four registered sugar refineries. The registered sugar factories are Mumias, Sony, Nzoia, Chemelil, Muhoroni (under receivership), Miwani (under receivership). Agrochemical Food Corporation (ACFC) (Muhoroni) produces ethanol and industrial spirit originally meant to be power alcohol from Molasses. Mumias factory is burning bagasse to co-generate electricity. ACFC has a methane recovery unit at its anaerobic ponds. The recovered methane is used to replaces fossil fuel for boiler operations

d) Pyrethrum

Pyrethrum products are considered the environmentally sound alternative to toxic synthetic pesticides. It is an important crop in Kenya's economy since it offers livelihood to approximately 200,000 households. It is also a major foreign exchange earner ranking fifth after tea, horticulture, tourism and coffee. Kenya is the leading world producer of natural pyrethrum producing 65-75% global annual produce[5] it peaked in 2002 with 174.9 tonnes but due to marketing failures, it is on steady decline mainly because the marketing has not been favorable to the farmers leaving them dissolution.

e) Livestock

The Livestock Sector contributes about 10% of GDP, accounts for 30% of the farm–gate value of agricultural commodities, employs over 50% of the agricultural labour force, and earns some foreign exchange through exports of hides and skins, dairy products and canned beef[13]. More than 60% of the land area is for livestock production located mostly in the arid and semi arid northern parts of Kenya. It is a major consumer of veterinary products to control livestock pests such as East Coast fever, tsetse flies, anthrax etc. These chemicals are to be found in dips and as sprays, which on several occasions are abused[6].

f) Horticulture Industry

Horticulture has continued to be one of the fastest growing sub sectors in Kenya's export sector, growing at rate of over 7% annually. Since 2003 horticultural exports have been the leading foreign exchange earner in the agricultural sector. In 2005, horticultural exports grew by over 19.1% over the 2004 export values (Central Bureau of Statistics, 2007). This continued growth is attributed to a dynamic private sector and the effective facilitative role provided by the relevant public and private sector institutions. This has been brought about by intensive market promotion programs implemented by the sector stakeholders.

g) Cut flowers

This is by far the most important component. In 2005, it constituted 45% by volume and 57% by value of total fresh horticultural exports. Kenya exports over 60% of its cut flowers to the Netherlands while the rest are exported directly to wholesalers and retail outlets such as supermarkets and grocers as well as other retail intermediaries mainly in Europe especially UK . Major cut flower exports from Kenya include roses, Carthamus, cuttings, cut-foliage, carnations, and *alstroemeria,*

h) Processed Horticultural Products

Exports of value added horticultural exports have been on the increase. This is as a result of increasing demand for natural foods as health consciousness increases among the consumers both in Kenya and the East African region. The main products under this category include canned pineapples, juices of mangoes, passion fruits and pineapples, canned vegetables, pickles, pastes, jams, jellies, marmalades and preserves. The export destination for the processed horticultural products is the regional market and the European Union for pineapples and passion fruits. Great opportunities exist in canning, freezing and drying (sun) and/or roasting. Another area that has seen significant growth in value addition is the pre-packs (consumer packs) for fresh produce meant for supermarkets. This industry is the key contributor to employment in the informal sector as well as steady cargo transport to Europe. This sector is a key user of fungicides and pesticides some of which fall under international control policies

[5] Kenya Investment Promotion Center, Sector Profile on Agriculture

[6] Inter ministerial Committee on alleged cancer cases in North Eastern Province

1.4.1 Other Key Economic Sector of Concern

1.4.1.1 Small and Medium Scale Enterprises in the Chemicals Sector

Kenya has a well-established and growing informal sector comprising of 1.3 Million SMEs employing about 7.57 million people and contributes about 18- 4% of the GDP. The rapid expansion of this sector is attributed to credit schemes through Non Governmental Organizations (NGOs) and cooperatives. 15% are in Nairobi and Mombasa while 12.2% are in other towns 65.% are in rural areas

Most of these SMEs are situated adjacent to/within residential areas, or in marginal and ecologically sensitive zones. They lack the appropriate waste management infrastructure such as sewerage and waste disposal services hence the significance of their negative environmental impacts. Their technologies are obsolete or only adapted to a particular need and hence they are inefficient in use of both energy and raw materials. The recycling sector SMEs use municipal waste as part of the input materials leading to higher toxicity. The cumulative environmental impacts from SMEs surpass that from larger industries. There is need to incorporate environmental measures in management of SMEs especially incorporating BAT and BEP guidelines and guidance. These SMEs products include recycled plastics, car batteries, aluminium cans, paper, and scrap metal among others. The sector lacks appropriate technologies resulting in production losses translating to heavy environmental impacts, especially due to the fact that few have done environmental impact assessment or environmental audits.

1.4.2 Transport

The public services sector in the context of this chemical profile includes public service, informal sector, building, and transport and retail trade. The main ones being retail and distribution system, waste treatment and waste water treatment, solid waste collection and disposal, disease and pest control, storage, vehicle and equipment repair, maintenance etc. Although difficult to quantify, the amounts of chemicals used encountered in the transport, energy and waste disposal subsectors utilize are substantial.

The transport sector includes roads, railway, roads and pipeline while the energy sector covers the power generation using hydro geothermal fossil fuels, solar batteries, hydrocarbon, refrigeration/metal treatment using ozone depleting substances, etc. It is the backbone of economic growth, employment and major foreign exchange earner. Agriculture also supports agro-based industries. By the year 2009, the contribution of agricultural sector to the GDP had increased from 37% observed in 1964 to 46%. The sector heavily relies on the use of chemicals fertilizers and pesticides to increase agricultural productivity and to protect crops and livestock against pests and disease vectors after harvest.

1.4.2.1 Services

Chemical use starts at home and is indicating by the following products and services:

foundries automobile service shops and gas stations, lead-acid battery manufacturing/recycling, chemical industries/laboratories, paint shops, printers, photographic processors, dry cleaners, Vehicle maintenance items e.g. antifreeze, brake fluid, Cleaning products eg drain cleaners, spot removers, toilet cleaners, chlorine bleach, oven cleaners ,Cosmetics e.g. nail polish and remover Fire extinguishers, pet care products e.g. Flea collars and sprays, Garden products e.g. herbicides, lawn chemicals, pesticides, Insecticides and insect repellent ,Home care products eg paint and paint stripper, wood stains, solvents, swimming pool chemicals etc.

1.4.2.2 The Informal Sector

Micro and Small enterprises are defined in this profile as those employing 50 workers or less. National development is largely dependent on the services of the informal sector. The sector has shown rapid growth in the last 20 years employing approximately 3.0 million people in 1998 and 4.0 million in 2009. It represents about 57% of the GDP. It is the second largest employer after agriculture and a majority of the low income workers depend on it. This sector includes beauty products, garages, hotels, vehicle repairs, furniture making and small scale manufacturing. In most of the cases the sectoral activities are carried out by unskilled or semi skilled people in unplanned work environments and sites such as kiosks, temporary and undeveloped facilities, residential premises or street corners. It uses chemicals and chemical products in such a diverse and widespread system which is not easily quantifiable but complex. It also generates complex waste streams which are regarded as domestic solid waste. Informal manufacturing sector employs 13% while other informal sectors employ 44%. It is notable that these sectors generate highly polluted wastes.

Table 1.9 shows the key chemical products produced across the country as shown in box 1. Table 1.9 compares the activities in the agricultural, mining and extraction sectors with the industrial sector with respect to the number of people likely to be impacted by the production and use of chemicals by these sectors.

Table 1.8 Industrial Employment by Production Sectors

ISIC	Description	Number of Facilities	Total Employment *(2007)	Kshs Mn/per yr	Major Pollutants (type)
31	Food Industry, beverage	1,025	82,950	41,155	Oxides of sulphur
32	Textile/clothing and leather Goods	859	45,139	94,647	Water pollutants
33	Wood and Wood products, printing	699	9,699		Paints, Lacquer
34	Paper and Paper products	114	8,593		Air, water pollutants
35	Chemical/coal/petrol/plastic products	485	37,867		Gaseous emissions, hydrocarbons plastic wastes
36	Other manufacturing industries	1,779	73,317		Various
37	Mining and Extraction (coal/oil/Natural/Gas/mineral/metals)	193	6,530	6,472	Various

2009 Statistical Abstract 2009 and industrial Development

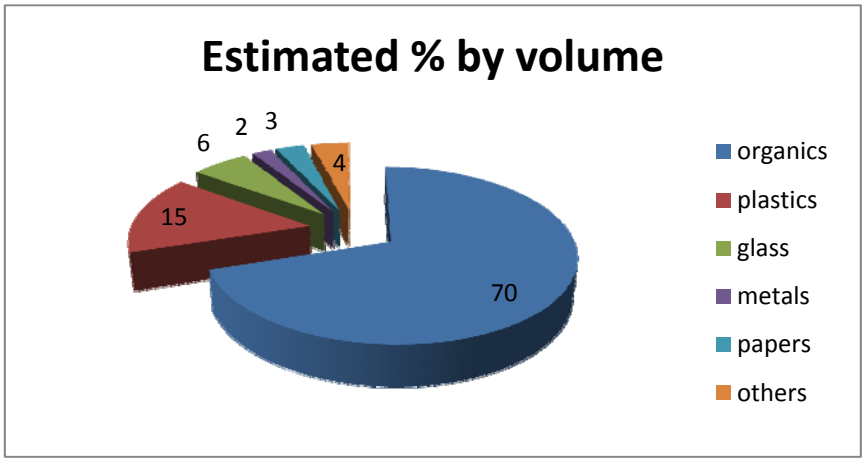
1.5 Other Key Economic Sectors Concern by major Economic Sector

The Kenyan Economy attained growth of 6.1% in 2006 compared to that of 5.7% in 2005 [Economic Survey 2007]. In 2006, the inflation rate increased from 10.3% in 2005 to 14.5% reflecting drought and soaring of oil prices. The high price of fuel and power would affect the economy continuously, and the industrial sector is anticipated to be obliged much more to tighten its management. the biggest sector is agriculture, which occupies a quarter of GDP; yet, the second group including manufacturing, wholesale and retail trade, repairs, and transport and communication is not so small in comparison with agriculture.

Most of the chemicals waste is usually organic waste which is most useful for energy conversion. Recyclable waste (for example, plastics, paper, cans, etc.), non-recyclable waste (that has no recycling value. There are regulations on segregation at source for recyclable waste. Other waste like hazardous waste has to be disposed off separately. See Fig 1 that shows the typical waste composition in Kenya urban areas.

Fig .1 graphical representation of waste composition for business enter

Fig 1.1Type of waste in a periurban town



1.6 Comments/Analysis

This situation calls for macro-economic policies which provide for a stable economic environment fostering business confidence; encourage a vigorous industrial sector and the development of human capital. Such policies could have resource implications such as increased consumption of goods and services. This would lead to an increase in demand for chemicals in both production and consumption which would subsequently lead to an increase in waste generation that is chemical by nature, and its associated treatment and disposal. Accumulation of these chemical pollutants in the environment is a health hazard and a threat to the markets where the products are exported. Misuse of chemicals is also Kenya's concern because of negative environmental and health impacts. In August 2010, Kenya adopted a new constitution which ushered in a new administrative structure under this new structure; Kenya has been divided into 47 administrative counties.

2 CHAPTER 2: CHEMICAL PRODUCTION, IMPORT, EXPORT, STORAGE, TRANSPORT, USE AND DISPOSAL

2.1 Introduction

The section discuses the chemicals imported into the country and those that are wholly or partially processed. For purposes of this profile;

a) "Chemical" means a substance whether by itself or in a mixture or preparation and whether manufactured or obtained from nature. It consists of the following categories: pesticides and industrial chemicals.

b) "Banned chemical" means a chemical all uses of which within one or more categories has been prohibited by Act of parliament, in order to protect human health or the environment. It includes a chemical that has been withdrawn by industry in order to protect human health or the environment.

c) "Severely restricted chemical" means a chemical virtually all use of which within

d) One or more categories have been prohibited by Act of parliament in order to protect human health or the environment, but for which certain specific uses remain allowed.

It is notable that Kenya is not a major chemical manufacturing country. However, most of the enterprises, agriculture and services use chemicals that are either manufactured locally in a fully or semi processed state or are imported.

2.2 Chemical Production, Import and Export

2.2.1 Chemical production including manufacturer of basic industrial chemicals and pesticides

The main activities that produce chemicals include:

(i) Metallurgical industries centered on iron, aluminum, copper, brass and steel production which provide a wide range of materials required by the engineering industry. This industry is important in recycling metal.

(ii) Chemical industries that provide fertilizers

(iii) Chemical-based recycling industries especially those using industrial wastes and by-products as well as agro-industries such as molasses, power alcohol etc.

(iv) Cosmetics, varnishes, oils, toiletry, soaps and detergents.

(v) Paints and resins

(vi) Plastics and rubber sector

(vii) Inert gases (Nitrogen and Neon)

2.2.2 Mining

Mining can be classified into the following categories: metals, non-metals and precious metals

2.2.2.1 Precious Metals

Kenya's mining industry is dominated by non-metallic chemical minerals such as, gold, fluorspar, soda ash, diatomite, gypsum, limestonnee. Approximately 70 -80% of mining in Kenya is done by small-scale to artisanal miners. The main mining operations under small scale include gemstonnee mining carried out at the coast region, gypsum mining at Kajiado and alluvial gold mining in western and northern Kenya. Currently, minerals contribute less

than 0.4% of the GDP though this does not take into consideration the expected mining of titanium in Kwale District, which will increase the proportion quite significantly
The artisanal miners of alluvial gold mining in western Kenya and the North Rift use mercury metal that reacts with native gold in its raw form to amalgamate the gold. Mercury is then evaporated leaving the gold to enter the environment through rivers. The process is not only a potentially health hazard to the miners but also environment pollutant as mercury is highly toxic aquatic organisms as Methyl Mercury which is a persistent organic pollutant. Kenya has been following the intergovernmental negotiations on the legally binding instruments on mercury[7].Fluoride in Kenya has been recognized as a serious problem especially in the central parts of Kenya due to it causing the mottling of teeth. Other likely problematic groups of chemicals related to metals are cyanides, from plating salts, phenols and strong acids. Fluorspars generate fluoride.

Table 2.1 summarizes the production in 2000 – 2008 of main minerals in Kenya.

Table 2.1: Quantity of Mineral Production between Years 2004-2008

Mineral (Unit tonnes)	2004	2005	2006	2007	2008
Soda Ash	353,835	360,161	374,210	386,578	502,846
Fluorspar	117,986	109,594	132,030	85,115	130,100
Crushed Soda	605,948	640,291	662,939	843,043	865,788
Diatomite	330	243	185	201	72
Vermiculite	400	370	350	300	320
Salt Crush/refined	31,139	26,595	35,024	11,596	24,345
Gold* (Kg)	567	616	432	3,023	343

Source: Central Bureau of Statistics, 2009/ Strategic Plan MENR (2008-2011)

Many negative effects have been associated with salt mining activities in Malindi and the coastal region

2.2.2.2 Other Chemicals Produced in Kenya

The following chemicals are manufactured in Kenya:

2.2.3 Power Alcohol

Power alcohol is manufactured as a byproduct during the manufacture of sugar at Mumias Sugar Factory, Agrochemical and Foods and Molasses. An environmental impact assessment of the two industries (Muhoroni and East African Agro Industries) has been done indicating their high potential to pollution in Lake Victoria.

2.2.4 Basic Chemicals

- Sulfuric Acid is manufacture by KEL Chemicals at Thika and East African Heavy Chemicals at Webuye. KEL Chemicals also manufactures fertilizer. Sulphonic and is produced by Orbit Chemicals in Athi River.

[7] www.unep/inc1/mercury

- Hydrochloric Acid was manufactured by the Pan African Paper Mills for its local consumption, but is currently closed.
- Pyrethrum-based pesticides, copper ox chloride, rodenticide etc. are manufactured but have to comply with the PCPB regulations.

2.2.4.1 Allied Metals

Allied metals include aluminum, copper, lead, zinc and magnesium

The type and range of chemicals used is as shown in Table 2.2. Chemicals which are produced in the Kenya are certified by the Kenya Bureau of Standards (KBS).

2.2.5 Imports

Kenya imports chemicals mainly from OECD countries, petroleum from the middle east countries and semi processed chemicals from the far east.

Tables 2.2 and 2.2 shows the list of the country's imports and exports respectively.

Table 2.2 Existing Category of Imports and Exports of Chemicals

Chemical Type	Production/manufacturing (tonnes/year)	Imports/year 1,000 tonness	Exports (tonnes/year)
Pesticides*	Nil	9,972	0
Fertilizers*	Nil	475,705	0
Petroleum Products	Nil	2,483.3	
Industrial	Nil	370,318	1,508,805

Source: Central Bureau of Statistics, 2009, *Pest Control Products Board Annual Report (2007)

The details of the imports by year and category is in Table 2A1 below

Table 2.3 Imports

Articles	Units	2003	2004	2005	2006	2007	2008
Chemicals							
Pigments, paints, varnishes etc	Tonnes	7 728	10,301	10,416	10,937	13,107	15,434
Soaps and cleansing preparations, perfumes	Tonnes	7,884	10,154	11,949	13,165	11,508	10,044
Waxes, polishes paste etc	Tonnes	366	286	436	796	374	489
Manufactured fertilizers							
Nitrogenous	Tonnes	69,122	167,986	105,600	177,404	117,853	129,057
Phosphate	Tonnes	221	27,950	117	2,986	10,306	14,716
Other formulations	Tonnes	315,311	326,486	330,013	299,023	216,827	331,932
Other Compounds							
Synthetic plastic materials	Tonnes	175,380	175,433	170,703	193,985	219,818	222,761
Insecticides, fungicides, disinfectants etc.	Tonnes	7,216	8,394	8,984	9,735	10,215	9,972
Manufactured goods, classified by Material							
Materials of rubber	Tonnes	2,301	2,037	2,333	2,152	2,974	2,056

Articles	Units	2003	2004	2005	2006	2007	2008
Chemicals							
Motor vehicle tyres and tubes	'000	240	295	1,580	686	874	936
Bicycle tyres	1000 units	1,858	2,780	1,337	1,551	1,343	1,319
Plywood	'000 (sq.m.)	1,489	2,209	2,034	3,637	2,218	2,948
Paper and paper board:	Tonnes	122,314	88,615	115,056	15,0235	174,197	321,815

Sourcwe: KNBS Statistical Abstract 2010

2.2.6 Exports

Some of these chemicals are in turn exported to other countries within East Africa and COMESA region. Approximately 8370 metric tonnes of pesticides with a value of Kshs 4.68 billion were imported into the country in 2005[8]. The major active substances involved were glyphosate(702,000 l),copper oxychloride (476,150 kg), mancozeb (449 000 kg), amitraz (433,388 l), 1,3-dichloropropene (432, 000), 2,4-diamine (240,600 l), sulphur (203,000 kg), chlorothalonil (203,000kg),(cuprous oxide(202,000kg), methyl bromide(187,000 kg) and dimethoate (173,320 l) in order of decreasing volume. In the year 2005 more insecticides

Table 2.4 List of Exports

Articles/Chemicals	Units/ Tonnes	2003	2004	2005	2006	2007	2008
Fluorspar	'000	75,807	85,055	102,719	98,126	71,736	105,805
Sodium carbonate	'000	331	572	12	317	737	711
Cement	'000	385	399	465	551	598	692
Motor vehicle tyres and tubes	'000	240	295	1,580	686	874	936
Bicycle tyres	1000 units	1,858	2,780	1,337	1,551	1,343	1,319
Plywood, veneer	'000 (sq.m.)	1,489	2,209	2,034	3,637	2,218	2,948

2.2.7 Chemical Use by Category

In general chemical use by sector is lead by agrochemichemicals which include in terms of quantity fertilizes and in toxicity pesticides, herbicides,ets. The second category are industrial chemicals and consumer chemicals.

The rapid expansion of the agricultural sector has resulted in increased demand for agrochemicals. Kenya does not have pesticide-manufacturing facilities but only formulates. There are about 32 registered enterprises involved in this formulation. The active ingredients are imported and the formulation carried out locally. This activity is associated with dust; offensive smells and related air pollution issues. Most of the industries have incorporated dust control equipment for the indoor environment. Operations focus on treating /recovering the collected dust which is part of their products. These products impact on the environment during usage. The accompanying wastes comprise organo-chlorines or organophosphate compounds, which are indiscriminately disposed in the environment. The other major players in this category include; Bayer EA ltd, Saroc ltd, Twiga Chemical Industries *Ltd.*Most of the fertilizers used in the country are imported, but of late some entrepreneurs have ventured into this area. The main fertilizers manufactured locally the phosphate ones (SSP). Inappropriate application of fertilizers has contributed to eutrophication of water systems. Table 2.5 is the chemicals ostly used

[8] Agrochemical Association of Kenya, Pest Control Products Board Annual Reports 2006

2.2.8 Pesticides

The pesticides industry consists mainly of firms formulating and repacking pesticide materials. The only raw material available locally is pyrethrin extracted from pyrethrum flowers.

A considerable proportion of pesticides still in use are highly hazardous, featuring one or more of three traits: high acute toxicity; chronic toxic effects even at very low exposure levels; and/or environmental toxicity, for example, in non-target and beneficial organisms. In developing countries in particular, highly hazardous pesticides (HHPs) can pose significant risks to food production, the economics of trade in agricultural products, human health and the environment. SAICM states that it is "critical for all stakeholders to take action on global priorities"....including, among others, "promoting alternatives in order to reduce and phase out highly toxics pesticides" (GPA Exec. Summary, para. 8(h)).

The main concern about the pesticides industry is that some pesticides such as organochlorines and organophosphates contaminate the water ecosystems and environment causing health effects to human and wildlife. In addition, organophosphate pesticides contribute to influx of phosphates into the aquatic system enhancing eutrophication. The water quality standards give the safe limit values of pesticides.

The present average annual volume of pesticide imports into Kenya is approximately 8,832 tons Of formulated products. This represents a value of 8.2 billion Kenyan shillings or approximately 91.4 million $US.

The large majority of pesticides are imported into Kenya by private sector distributors and retailers, reflecting major change since the 1990s when pesticides were also imported by the Government and its agencies through commodity aid that often led to oversupply. Direct pesticide imports by the state are now virtually non-existent, and state-funded imports appear to be limited to pesticides bought by the Ministry of Health through donor funds.

A large part of pesticide distribution to end-users is also done by private sector distributors and retailers, although exact figures are not available. Furthermore, private distributors deliver the pesticides they import to commodity companies which in turn will distribute the products to end-user farmers. The private sector may also deliver pesticides to government structures who the distribute them to end users e.g. mosquito bed-nets procured through donor funds, supplied by development partners and distributed through Ministry of Health clinics.Data on the actual use of pesticides in various sectors or crops in Kenya are incomplete, and inonly in a few cases could relatively reliable estimates be obtained. Major uses are in floriculture and horticulture.

Table 2.5 Chemical Use By quantities

Type of Chemical	Tonnes Used/year '000)
Pesticides – Agricultural	9,972
Fertilizers	331,932
Petroleum Products	3133.2
Paints, pigments, varnishes	15,434
Soaps and cleansing products	10,044
Manufactured Fertilizers Nitrogenous Phosphate	129,057 331,932 14,716
Synthetic Plastic Materials	222,761
Total	**1,068,981**

The chemicals imported and used are shown in Table 2.D and shown in Fig 2.

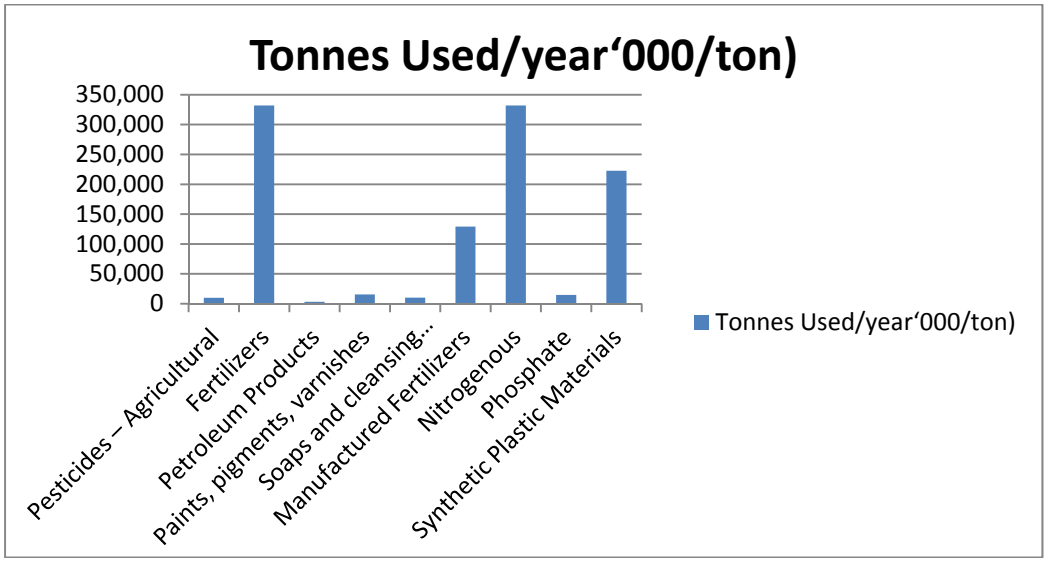


Fig 2.1 Chemicals in Use

2.3 Cement and Lime Products:

There are three cement plants whose combined production capacity is 2.87 million tonnes per year namely Bamburi (Nairobi and Mombasa), Athi River, Portland Cement and Athi River Mining Kaloleni. Domestic consumption of cement is 2.1 million tonnes per year leaving a surplus of 0.77 million tonnes for export. The main raw materials for cement production are limestonnee, pozzolana and gypsum all available in various parts of Kenya. A new plant has started in Pokot in the North Rift Valley. They largely use heavy diesel oil and some coal for heating the kilns. Major environmental concerns about this industry are air pollution from dust particles and creating the risk of developing respiratory diseases. It is also a serious source of carbon dioxide and oxides of sulphur which cause air pollution, acid rains and global warming. Cement factories are major users of coal.

2.3.1 Ceramics:

There are three ceramic plants producing various types of products such as crockery, wall tiles and sanitary ware. They include Athi River Mining and Saj Ceramics Both ceramics and cement industries located in Athi River in Mavoko Municipality. The basic raw materials for ceramics silica such as sand, and Kaolin, Kisii Soapstonnee and quartz are locally available. However, despite the fact that adequate raw materials are available locally, the industry lacks adequate capacity to meet the local demand and there are large imports from Europe, China and India subcontinent. There is a high report of imports from Italy, India and China.

2.3.2 Glass

The basic raw materials for glass manufacture are soda ash, silica sand, sodium sulphate and fluorspar which are locally available. Central Glass Industries located at Ruaraka in Nairobi is the main glass manufacturing enterprise for glass. It also uses recycled glass from soda and

beer industries and other sources. The main concern about the glass industry is that the high temperatures necessary during the manufacturing process causes air pollution while the normal manufacturing process may produce particulate matter expose one to respiratory diseases, digestive disorders, skin diseases, rheumatic and nervous conditions, hearing and visual disorders. The Central glass industries regularly audits its operations so as to incorporate environmental corrective measures

2.3.3 Petroleum Products:

Hydrocarbons form the major inputs of many chemical based industries as well as energy generation. In 2009 Kenya imported 1,773,000 tonnes of crude and refined products. These include crude materials, aviation spirit, crude petroleum, motor spirit, kerosene, illuminating oil, jet fuel, gas oil, diesel oil and other oils. Some of the imported petroleum is re-exported to neighboring landlocked countries of Rwanda, Burundi, Eastern Zaire and Uganda. The transport sector (rail, road, marine and aviation) is the largest consumer of petroleum fuels. The key products of petroleum are gasoline, liquid petroleum and butane with the rest consisting of others and chemical products like aerosol cans such as butane.

Figure1. Share of Petroleum Consumption by fuel Category, 2007: Source: Kenya Facts and Figures

Table 2.6: Domestic Consumption of Petroleum Products

Hydrocarbon Product	'000 Tonnes			
	2005	**2006**	**2007**	**2008**
Coal and Coke				159
Liquefied petroleum gas	49.4	64.6	77.4	84.4
Motor spirit(premium and regular)	333.7	358.2	367.1	381.3
Aviation spirit and Jet/turbo fuel	2	2	2.2	2.5
Illuminating kerosene	307	279.2	265.2	614
Light diesel Oil	892.4	1,035.6	1,116.5	1,157
Heavy diesel Oil	25.5	40.7	40.1	189
Fuel Oil	546.7	664.6	614.8	698
Total	**4,161.7**	**4,450.9**	**4,490.3**	**5,293.2**

Source, Economic Survey, 2009 and Petroleum Institute of East Africa[9]

[9] www.petroleum.co.ke

2.3.3.1 Fertilizers:

In 2009, Kenya had one plant fertilizer (KEL Chemicals Ltd) which has an annual production capacity of 40,000 tonnes (the local market demand) of super-phosphate. The rest of the chemical fertilizers, whose demand is about 344,000 tonnes per year, are imported. Other sources of fertilizer imports are normally in the form of aid from the US, Gulf States, Europe, the Middle East and Asia. The imports for 2008 given n Table 2.

Table 2.7 Fertilizer Imports

Manufactured fertilizers:	**Tonnes**
Nitrogenous	129,057
Phosphatic	14,716
Other	331,932

Current annual consumption is considerably below the level required for a growing agricultural sector, estimated at 400,000 tonnes. Donor-aid fertilizer has constituted about 40 per cent of phosphate (DAP) for planting and Calcium Ammonium Nitrate (CAN) for top-dressing. Also large amounts of NPK 25:5:5 + 5S are imported and used mainly for use in tea plantations. The main concern about fertilizer industries is that most farmers are not familiar with the chemical nature of fertilizers or the soils to which they apply the fertilizer. There have been cases of misuse of fertilizers[10]. In addition, run-off from agricultural fields with heavy fertilizer uses contributes to nutrients enrichment of the rivers and lakes with nutrients accelerating eutrophication. For instance the growth of ***savinia molesta*** in Lake Naivasha and of the proliferation of water hyacinth in Lake Victoria often cost Kenya Millions of shillings due to reduced fish catch for export. The high toxicity levels encountered in these environments is attributed to high rate of discharge of nitrates and phosphates from sewage treatment works. Discharges into rivers and lakes are regulated by Water Quality Standards and guidelines.

2.3.4 Soaps, Perfumes, Cosmetics and Other Toiletry Preparations:

There are 43 registered manufacturers of soaps, detergents, disinfectants, cosmetics and perfumes. Most of the raw material inputs are imported; despite good potential for their local production exist. For instance sodium hydroxide, essential oils, vegetables, are readily available. The imports for soaps are given in table 2.8:

Table 2.8 Soap, Waxes and Polish Imports

Products	**Quantity(**tonnes)
Pigments, paints, varnishes etc	15,434
Soaps and cleansing preparations	10,044
Waxes, Polishes, pastes, etc	489

The paint and lacquer industry is the most widespread. Spray painting for vehicles is the most effective exposure system. In addition, the paint industry which also falls under this category is a source of heavy metals (chromium, copper, zinc, iron etc), pigments, solvents and organic residues that are of environmental concern. Risks to chemicals in paints are most widespread for the informal sector.

[10] Water Quality Standards, Ministry of Water and Irrigation, Water Resources Management Authority

2.3.5 Plastics

Plastics constitute a wide range of fairly safe chemicals. However, when they become waste, they pose a major disposal problem. There are about 100 manufacturers of plastic products in the country employing over 8,000 people[11]. This sub sector has grown more tremendously than any other sub sector since independence. The products are locally marketed and also exported to the COMESA sub region. Almost all the raw materials are imported. There are also 20 plants involved in recycling of plastic wastes. Production of plastics utilizes many organic chlorine compounds such as vinyl chloride which are carcinogenic. The waste plastics are a major concern in Kenya mainly because of the way they are disposed usually through open burning generating dioxins and furans. Recycling can be the basis of many SMEs.

Plastics are not just dangerous because they are not biodegradable but also in the methods currently used in their disposal which is mainly via burning. The process of burning plastics generates many highly toxic chemicals including dioxins and furans, which make up some of the compounds restricted under The Stockholm Convention of which Kenya is a Party to. There are major moves to restrict use of polythene carrier bags and in packaging because of aesthetics, blocking of sewers holding water which becomes bleeding ground for mosquitoes.

The banning or restriction of plastic bags thickness of 15 microns will greatly reduce dioxin emissions in the environment. However other sources like pulp paper bleaching and steel rolling mills also contribute significant amounts of dioxins in the environment.

2.3.6 Paper

About 250 chemicals have so far been identified from pulp and paper industry world-wide. Production at the mills is accompanied by emissions to air, water and by generation of solid wastes. The main characteristic of water polluting factors from the pulp and paper industry are atrophying substances, coloring compounds, suspended solids, oxygen demanding substances and hazardous compounds. This affects plant and animal communities around areas of pulp and paper mill effluent. Experts have identified effluent in pulp and paper mills that include heavy metals, reduced sulphur compounds, resin acids. The heavy metals get absorbed in water to suspended and bottom sediments. During the study carried out a decade ago, in River Nzoia, some heavy metals was rather low. The pH levels observed by researchers in the wastewater from the mills and downstream water could have caused precipitation of some of the heavy metals, thus lowering their concentration in water.

[11] Kenya Association of Manufactures-Section Profile

Fig 2.3 Webuye Paper Mills

Panafrican Paper Mills (E.A) Ltd., (Panpaper), is an integrated pulp and paper mill producing bleached and unbleached sulphate pulp for manufacture of paper and paper boards. The main cooking reagent is sodium hydroxide and sodium sulphide. Sodium hydroxide is generated from the reaction between lime obtained by burning limestonnee/lime sludge from the plant and sodium carbonate obtained from dissolving smelt, a product of burnt black liquor (spent cooking liquor).There was hue and cry early in the year when the country's and region's sole paper mill, The Pan African Paper Mills (Pan paper) based in Webuye town had its operations brought to a halt and closed doors owing to stiffening financial situation at the firm. Indeed Webuye town of western Kenya with an estimated population of over 80,000 has its main economic activities directly or indirectly centered to the Mill with about 80% of its workforce either employed in the Mills or working in the government. Some reports indicate that the concentration of chlorine in the atmosphere in the bleaching section of the mills is three times more than accepted levels.

Fine particles of ash carried out of the mills' furnace with the waste gases produced during combustion have been detected at a distance as far as one kilometer around the mills. The local inhabitants point at the fine-particulate ash as the main cause of massive corrosion and discoloration of rooftops and vegetation evident within the mills' vicinity. Approaching Webuye town during the mills' operations is a rather difficult experience. A vile odor fills the entire town and its proximity. The excessive stench around the mills' home is as a result of hydrogen sulphide, methyl mercaptans , dim ethyl disulphide and dim ethyl sulphide produced during Kraft pulping-a method of digesting wood which makes use of sodium hydroxide and sodium sulphide at high pressure and temperature . Although there are several other methods of digesting wood, Pan paper uses the Kraft option. The factory bleaches about 80 tonnees of its pulp per day using chlorine and sodium hypochlorite. For this, between 11 and 120 kg of active chlorine is used for every tonnee of pulp bleached. The pulp is then dried for storage or export, or is converted into paper directly.

c) Dioxins and Furans

Depending on the amount of alkali used in the cooking and other cooking parameters such as hold time at pressure and temperature two types of pulps are obtained.

It is during bleaching at the elemental chlorine stage that comparatively high formation and release of polychlorinated dibenzo – ρ – dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCB) occur.
Of these compounds only polychlorinated dibenzo – ρ – dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) have been identified as being unintentionally produced during the production of pulp using elemental chlorine. Of the 17 PCDD/PCDF congeners with chlorine in the 2,3,7 and 8 positions, only two congeners – namely 2,3,7,8 – tetrachlorodibenzo – ρ – dioxin (2378 – TCDD) and 2,3,7,8 – tetrachlorodibenzofuran (2378 – TCDF) – have been identified as potentially being produced during sulphate bleaching using chlorine(Guidelines on BAT and Guidance on BEP, 2004 Draft).

2.4 Storage of chemicals and Related Issues

The bullk chemicals are stored in Magadi Soda, Cement factories, for cement and soda ash.
Ethanol is stored in bulk at agrochemicals and Foods, Molasses factory in Kisumu and London Distillers in Athi River. In addition all the major factories do one form of liquid and solid storages. Bulk gas storage are lead by liquid petroleum gas.The major storage facilities are reted to crude oil, refined oils, diesel, keroisene and lubrication oils. The key storage areas are Mombasa, Nairobi, Nakuru and Eldoret.

Table 2.9 Kenya Petroleum Sales

	YEAR							
Products	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Jan – March 2011**
Avgas	2,462	2,763	2,752	2,999	3,380	2,007	2,672	560
Jet A-1	675,930	710,670	751,927	808,363	705,705	740,211	747,841	211,216
Premium Gasoline	376,034	383,267	429,900	438,545	417,794	542,856	633,397	162,395
Regular Gasoline	86,453	81,258	79,056	73,241	61,033	55,158	56,953	13,835
Kerosene	305,825	389,607	364,234	329,853	285,003	374,945	323,441	75,277
Gas Oil	948,066	1,052,581	1,221,373	1,370,126	1,429,838	1,675,577	1,583,718	390,766
Industrial Diesel	30,787	29,623	45,292	47,007	30,344	23,897	26,570	8,607
Fuel Oils	472,107	586,661	713,702	674,809	600,999	590,944	570,232	165,751
LPG*	41,884	48,827	64,639	74,017	78,030	59,773	63,779	15,193
Bitumen*	8,262	11,650	14,634	16,677	17,733	12,405	7,761	3,665
Lubricants	36,508	30,965	39,336	33,074	32,675	26,514	30,970	10,061
Greases*	604	1,206	3,775	3,130	2,431	1,429	1,069	142
TOTAL	**2,984,922**	**3,329,078**	**3,730,620**	**3,871,841**	**3,664,965**	**4,105,715**	**4,048,404**	**1,057,468**

2.5 Transport of Chemicals

Kenya is a transit state for the East African Community[12] and central African republics
There have been frequent accidents of the trucks carrying chemicals and hydrocarbons largely on the Mombasa Malaba Roads. These accidents involve international trucks transporting oil to Rwanda, Burundi, Eastern Congo and Sudan. However a few cases have also occurred involving trucks carrying chemicals and alkalis mostly sulphuric acid from East African Heavy Chemicals in Webuye and Kel Chemicals.

2.6 Chemical s Trade

Trade in chemicals involves production, transport and use. Table 1.D above shows the key sectors where chemicals are used. These are just estimates as the provision of information in the chemical trade and the way it is controlled is a key determinant to chemical management and of chemical risks. Since 2004, Kenya has been under a policy of trade liberalization. Unfortunately under this policy, there has been reduced monitoring and reporting which in turn affects data and statistics on chemical produce, use, transport and disposal. Most chemicals are imported but disposed through small scale enterprises after value addition or repackaging. This happens mostly with pesticides, hydrocarbon, paints, solvents, pigments and lacquers. Some chemicals and waste include: Flammable e.g. solvents - from chemical manufacturers, laundries & dry cleaners, metal plating, tanneries, print shops etc. Corrosive acids and alkalis - from cleaning & maintenance, equipment repair, vehicle body shops etc, Reactive e.g. bleaches and oxidizers - from chemical manufacturers, laboratories etc, toxic and eco-toxic e.g. heavy metals, pesticides, cyanides from metals manufacturing**,** photographic processing, pesticide end users etc.

2.6.1.1 Transit Cargo

The Port of Mombasa provides an entry and outlet for the land locked countries which include Uganda, Rwanda and Burundi. In the period between 2000– 2008, the Kenya railways handled approximately 1.8 million tonnes of cargo annually. Of this 72% was made up of imports, while 44% of the traffic was oil. Transit traffic bound for neighboring countries makes up 15% of total traffic. It is notable that 70% of Kenya Ports Authority hinterland bound traffic is handled by the road network while the railway handles the chemicals.

2.6.1.2 World custom Unions

Kenya is a member of the World Customs Organization (WCO) concerned with harmonization and uniform application of customs systems and procedures governing the movement of commodities, people and conveyance across customs frontiers.

As International trade statistics is key to foreign trade and an important source of economic indicators of any country the accuracy of this kind of information is essentially dependent on the correct classification of goods. The WCO therefore promotes the Harmonized Commodity Description and Coding System (or the Harmonized System)

[12] The East African Community (EAC) is the regional intergovernmental organization of the Republics of Kenya, Uganda, the United Republic of Tanzania, Republic of Rwanda and Republic of Burundi with its headquarters in Arusha, Tanzania.

The Treaty for Establishment of the East African Community was signed on 30 November 1999 and entered into force on 7 July 2000 following its ratification by the original three Partner States – Kenya, Uganda and Tanzania. The Republic of Rwanda and the Republic of Burundi acceded to the EAC Treaty on 18 June 2007 and became full Members of the Community with effect from 1 July 2007.

tariff nomenclature used as a basis for collection of customs duties and international trade statistics, surveillance of controlled goods and enforcement (risk assessment and targeting).

2.6.1.3 Detailed National Customs Tariff Nomenclature

At the request of several United Nations organizations, the WCO has adopted recommendations to monitor trade in ozone layer depleting substances, environmentally hazardous materials and toxic wastes. Kenya has therefore amended the customs tariff to facilitate monitoring of chemical substances controlled under international conventions. For example CFC-11 (trichlorofluoromethane), CFC-12 (dichlorofluoromethane), HCFC-22 (chlorodifluoromethane) and CFC-113 (trichlorotrifluoroethane) classified in HS heading 29.03.

2.6.1.4 Training of Customs Officers

In cooperation with the WCO, the secretariats of Multilateral Environment Agreements (MEAs) that have trade provisions, such as the Basel Convention on the Transboundary Movement of Hazardous Wastes and their Disposal, and the Montreal Protocol on Substances that Deplete the Ozone Layer, have trainer-training programmes. Two (2) Kenya customs officials have been trained. Training is also anticipated concerning national implementation of the Rotterdam Convention on Prior Informed Consent (PIC) and the Stockholm Convention on POP.

2.7 Overview of Technical facilities

Wastes can be categorized based on their sources and variations in chemical compositions. These categories are: industrial, domestic, municipal and agricultural wastes. In Kenya, waste generation has been increasing over the years with increasing population, level of industrial development and consumption patterns. In the early years of Kenya's development, disposal of waste was merely a re-circulation of matter in the environment. However, the rising socio-economic development has increased the waste volumes accompanied with complexity in their nature; this has resulted in a big proportion of waste being non-degradable, such as plastics, packaging materials, scrap metals and other consumer goods residues. There are also examples where chemical contaminants released from dumping sites have caused direct harm to humans and, more commonly, destroyed environmental resources to the extent that they can no longer be used for human dwelling or activities.

A study of one of Africa's largest waste dumpsites, the Dandora Municipal Dumpsite in Nairobi, found that half of the children tested in the area surrounding the dumpsite had concentrations of lead in their blood exceeding internationally accepted levels. 42% of soils samples from the dumpsite recorded lead levels almost 10 times higher than those found in unpolluted soil. The children had been exposed to pollutants such as heavy metals and other toxic substances through soil, water and air (smoke from burning of waste) leading to respiratory, gastrointestinal, and dermatological diseases. Almost half of the children tested had respiratory diseases, including chronic bronchitis and asthma (UNEP, 2007).

2.8 Overview of Capacity for Disposal of chemicals

It is important to appreciate the role that people play in the generation and management of hazardous wastes. For Kenya, for a period of 40 years (between 1963 and 2003), the population has

risen from 8.6 million in 1963 to about 33 million. The majority of the population is dependent on their immediate environment for their social economic needs. 44% of the population is less than 15 years old and therefore we are at a critical time to inculcate sound waste management philosophy. 54% is 15-64 years and active in generating waste. 2% over 65 years contributes little to waste generation. In very few cases (3) there are low scale incinerators as shown below for Kenya Medical Research Institute. Many facilities have in the past disposed clinical waste with other municipal waste with disastrous results of recycling. As a result, they subject it to open burning in open pits which besides being against the spirit of the Stockholm convention is also very unsanitary. Established hospitals have "incinerators" which are just burners. District hospitals ought to be equipped with incinerators under the Kenya Immunization Program (KEPI).

The quantity and type of waste is dependent on the population distribution. For Kenya, 70% of the population lives in rural areas and some 60% are involved in agricultural practice or other. Of the urban population almost 60% live in informal settlements and engage in the informal sector employment characterized by small streams of highly toxic and hazardous wastes. Growth is currently 8%. The urban centers of Nairobi, Thika, Mombasa, Nakuru, Kisumu, Eldoret and Mavoko have the highest populations and the highest incidences of environmental pollution because of their high concentration of chemical based activities.

Of the municipal wastes generated in the urban centre 21% emanate from industrial enterprises and 61% from households and institutions. Generally about 40% of the total wastes generated in the urban centre are collected and disposed off at designated disposal sites all such sites are dumpsites as there are no sanitary landfills in Kenya. Open burning of waste at these dumps and landfills are the greatest sources of air pollutants such as sulphur oxides, oxides of carbon, particulates, dioxins and furans.
Such waste also may have industrial waste composed of toxic chemicals including heavy metals, salts, detergents, and medical waste. This is dumped in unsuitable areas or let to pour into rivers that traverse the urban centers, wetlands and ecosystems. Such is the case with the rivers in the Nairobi River basin which has unacceptable levels of chemical oxygen demand, heavy metals and pesticides.[13] In addition, a significant number of municipalities in Kenya do not have designated disposal sites and in those towns, the mode of transportation of waste or its disposal is neither regulated and lacks coordination.

This is likely to change when waste regulations by the Government of Kenya which requires that all transporters and those treating or disposing waste should be registered with the national Environment Management Authority (NEMA) comes into force[14], Table 2.10 is the composition of solid waste generated in Nairobi. That from other cities is similar but those from rural ares are richer in organic components.

[13] UNEP/Regional Office for Africa: Report of Phase I and II of Nairobi River Basin Program
[14] GOK/MENR/Waste Regulations

Table 2.10 Waste Composition in Kenya

Composition	Urban	Semi-urban	Rural
	%	%	%
Dust	5	20	38
Wet waste (food /sweepings)	50	48	40
Plastics	16	10	40
Soft – Flimsy	10	6.5	3.5
Hard – PVC	6	3.5	1.5
Paper	16	10	4.5
Paper packages	2	2	1
Uncoated	9	5	2.5
Coated	5	3	1
Metal	2	2	1
Glass	2	1	1
Textile	2	2	2
Rubber	2	1	1
Disposable diapers/feminine napkins/ medical waste	1	1	1

Source: Nairobi ISWMS – 2010

2.9 Stockpiles, waste Deposits and contaminated Sites

Nearly all chemical based industries generate some form of hazardous wastes. The quantity of hazardous waste is not the only concern since even a small quantity of chemically complex hazardous waste may be more problematic than a large quantity of a relatively simple waste. It will be observed that most of pharmaceutical and cosmetic outlets are also key sources of dispersing wastes since they are located all over the country. Their use in areas categorized as safe such as hair salons, restaurants, etc where wastes are put in baskets to be disposed as normal municipal waste becomes an issue of concern.
During the establishment of the new hazardous waste control regime, NEMA targeted a big number of large generators of hazardous wastes especially from the large industries. The EMCA 1999, NEMA requires all existing industries to submit annual Environmental Audit Reports for evaluation. Already over 4,000 audits have been developed related to chemical sources.

The new regulations on waste gazette in 2006 are in force. Some small scale generators of hazardous wastes include:

- General engineering and manufacturing industries for ferrous and non ferrous products
- Machinery and vehicle manufacture, garages and petrol stations
- Electrical and electronics industry, computers, printers, copiers, faxes
- Wood preservation chemicals mainly chromium based

These kinds of small and medium sized industries are mainly in the country and may produces wastes which are by nature more toxic as described here below:

- General engineering such as Electroplating facilities, Garages, Scraps (iron, aluminum, copper), Iron melting/scrap melting, Copper smelting plants and Aluminum smelters
- machinery including motor Assemblies and garages
- Petrol stations and garages
- Electrical – Electronics - Metal recovery yards
- Radio/television and electronic repair shops and dismantling facilities and electronic waste dumps

c) Wood Preservative, electrical and telephone poles and timber preservation chemicals

2.10 Disposal of Hazardous Wastes

It is estimated that the bulk of hazardous and toxic waste enter the environment as liquid wastes.

- Most liquid waste containing hazardous waste is discharged into rivers or carried by runoff eventually ending in rivers and ground waster.
- Of the 172 local authorities only 32 have some form of sewage treatment and disposal.
- 2 Local Authorities(Nairobi and Kisumu) with Conventional treatment
- 30 have oxidation lagoons which can only treat organic waste and not possible to treat persistent chemicals.
- Much hazardous waste sludge from these treatment works end up running off.

Below are the disposal systems for specific streams

- Industrial waste
- Obsolete pesticides
- Clinical wastes Sewage Sludge
- Agrochemical Wastes
- POPs contaminated waste.

In Kenya industrial waste and pollution management is faced with a lot of challenges including appropriate disposal sites, treatment technologies and the high costs associate with waste treatment. From environmental point of view, waste minimization at source is preferred as opposed to the production of waste then treating it, commonly referred to as end-of-pipe treatment. Industrial waste is in three basic categories of wastewater, solid waste including sludge and air/emissions pollutants.
Wastewater treatment mechanisms depend on the nature and level of pollutants. Costs and energy efficiency also enter into the selection of the treatment methods. The following treatment methods are practiced in Kenya. This is often the primary stage in wastewater treatment. The purpose is to remove suspended matter including oil and grease. This achieves uniform flows and concentrations while also reduce the BOD and COD. During secondary treatment biological and chemical processes are used to remove the remaining matter.

2.10.1 Industries

Sources of Industrial Hazadous waste

- 14 tanneries processing 920,000 hides, 6.5m skins per year.
- 1 Pulp and Paper with 145,000 tonnes per year from 1000.
- Petrochemical Industries especially tetraethyl lead and waste oil.
- Chemical based Industries.
- Pesticide Industry.
- Plastics Industry.
- Iron and Steel Scrap refining.
- Non ferrous Metals refining.
- Motor vehicle and automotive components.
- PCBS = 10 tonnes identified.

2.10.2 Obsolete pesticides

They represent an obvious hazardous aspect because of poor management.

- 10,000 tonnes estimated nationwide.

- 2,000 tonnes already qualified.
- 2,000 tonnes waiting disposal.

Most of the absolute waste is in a state of mismanagement perhaps due to lack of guidance which is now NEMA'S major concern and priority activity

The technology to dispose of pesticides in an environmentally safe manner is very limited in Kenya. Currently, there are two known companies with incinerators. These are Bayer East Africa (Private) and Environmental Combustion Consultants (ECC) Located at Kitengela 40 Km from Nairobi. All the chemicals in Kitengela have since been disposed through incineration under the supervision of Pest Control Products Board. The empty metallic containers were disposed by smelting in steel milling plants. The main challenge is to collect all obsolete pesticides that are located in different areas of the country and also meet the costs of transport and eventual destruction at Kitengela which is a commercial hazardous waste destruction facility.

Collection of empty pesticide containers from farmers has been a major challenge as only large scale growers have the capacity to collect and deliver for disposal to the facility at Kitengela. Plastic sheets, empty plastic containers and spraying equipment are recycled by making fencing poles. Every flower farm has put systems in place that ensures that pesticides contaminated washings are decontaminated before releasing into the environment

2.10.3 PCB Wastes

The PCB wastes problem occurs in virtually all regions of the country. These wastes are likely to be found in electrical equipment e.g. transformers and large capacitors especially those procured before 1985. The local and national capacity to handle, manage and dispose industrial POPs is inadequate. The technologies that are used to safely handle and dispose of PCB wastes are not available in Kenya.

The capacity to analyze PCBs in Kenya is inadequate as the leading laboratories lack reference standards and other important accessories to enable timely analysis.

Although Kenya has enacted laws and regulations regarding evaluation body chemical substances, industrial chemicals are sometimes not subject to regulations except in terms of meeting commercial standards. However, under EMCA, there is a now a draft regulation for their registration.

In 1995, the Swiss government advanced to Kenya Power and Lighting Company (KPLC) 1.2 million francs for the disposal PCB containing equipment. The project carried out the following activities

- Analytical investigation (site survey)
- Excavation and packaging of contaminated soils and decontamination of the sites
- Transport and professional disposal.
- Disposal of the buried PCB containing capacitors to avoid further contamination of the soil.

KPLC cannot be declared free of PCBs because the operations only focused on ripple system capacitors but transformers were not included. The company is in the process of formulating a disposal policy. The possibility of making the suppliers of equipment responsible for disposal is also being looked at. Since then, use of PCB containing equipment and transformers had been discouraged though no written directive shows this in any of the enterprises in Kenya.

The existing legal framework in Kenya is not specific enough to deal with PCB wastes. The technologies for handling and management are lacking in the country hence there is need to identify those that can be introduced into the country.

2.10.4 Electronic Waste

The world is consuming more and more electronic products every year. Invariably a great number of televisions, VCRs, DVD players, stereos, computers and other electronic appliances are reaching their end-of-life and/or are replaced. In the year 2005 alone, $125 billion dollars worth of consumer electronics were purchased. Every year, hundreds of thousands of old computers and mobile phones are dumped in dumpsites, landfills or burned in smelters. Thousands more are exported, often illegally, from Europe, USA, Japan and other industrialized countries, to Third World countries. This has caused a dangerous explosion in electronic scrap (e-waste) containing toxic chemicals and heavy metals that cannot be disposed of or recycled safely. Recently, the Kenya government embarked on an extensive e-government programme. Consequently, many government forms and services, including tax forms and crime reporting to the police, are now accessible electronically. Embracing this technology has resulted in an increase in the use of computers and other computer accessories such as printers, scanners and photocopiers. With regard to e-waste, a number of stipulated objectives within the Convention should be emphasizing the reduction of trans-boundary movements of hazardous and other wastes subject to the Basel Convention; this should include obsolete electronics and electronic waste as these contain toxic materials; prevention and minimization of the generation of hazardous wastes through the manufacture of longer lasting consumer electronics; and the active promotion of the transfer and use of cleaner technologies and this includes using safer alternatives to the hazardous material in electronics.

2.10.4.1 Battery Recycling

(a) Lead-Acid Automobile Batteries

All lead-acid batteries can be recycled. Retailer who sells lead-acid batteries should also collect used batteries for recycling, as required by law in many developed countries. Reclaimers crush batteries into nickel-sized pieces and separate the plastic components. They send the plastic to a reprocess or for manufacture into new plastic products and deliver purified lead to battery manufacturers and other industries. A typical lead-acid battery contains 60 to 80 percent recycled lead and plastic.

Recycling batteries keeps heavy metals out of landfills and the air. Recycling saves resources because recovered plastic and metals can be used to make new batteries. However, the country is currently experiencing shortages of recyclable lead due to high demand of the same by China's automobile industry

(b)Non-Automotive Lead-Based Batteries

Gel cells and sealed lead-acid batteries are commonly used to power industrial equipment, emergency lighting, and alarm systems. The same recycling process applies as with automotive batteries. An automotive store or a local waste agency may accept the batteries for recycling.

Alkaline and Zinc-Carbon Batteries

Alkaline batteries, the everyday household batteries used in flashlights,

remote controls, and other appliances. Several reclamation companies now process these batteries.

Buttonne-Cell Batteries

Most small, round "buttonne-cell" type batteries found in items such as watches and hearing aids contain mercury, silver, cadmium, lithium, or other heavy metals as their main component. Buttonne cells are increasingly targeted for recycling because of the value of recoverable materials, their small size, and their easy handling relative to other battery types.

(c) Rechargeable Batteries

Some Kind of rechargeable batteries which can be recycled include:

- nickel-cadmium (Ni-CD),
- nickel metal hydride,
- Lithium ion, and small-sealed lead.

A charge up to recycle program offers various recycling plans for communities, retailers, businesses, and public agencies. Small Scale Enterprises (SMEs) are some of the keys sources of hazardous waste problem in Kenya. For instances a study of wastes generation in Thika attributed 80% FKE of the hazardous waste problems to small generators in just two sectors: metal finishing include Galvanizing plants – Galsheets, Home utilities e.g. cooking. There are those with small but intensively toxic streams such as, Leather finishing which include, Leather finishing industries, Kenya leather, Thika and Bata Shoe, Limuru.

Small workshops generally operate in cramped conditions and lack space for the on-site treatment, to 'separate' hazardous waste waters into waste water acceptable for discharge to sewer from more concentrated solutions or sludge's to be disposed of as hazardous wastes in order to comply with waste water standards and guideline. Figure 6 shows an example of wastes awaiting disposal.

Fig 2.4 Waste in containers awaiting final disposal

Source Kenya POPs Office

2.10.5 Petroleum waste Products

2.10.5.1 Waste Oils

Oils have potentially significant positive as well as negative impacts. When fresh they are useful in servicing and maintenance of vehicle as well as many other machines. Once they are used however, they pose threat to sound environmental management in a sustainable manner; human health; machine life as well as economy in general. Waste oil is produced when used oil is drainned off for replacement with fresh oil during servicing of vehicles or machines. In most cases, the owners of the vehicle and/ or machine will hold claim on to the drained-off waste oil. The reason to this is, there is no incentive for leaving waste oil for safe disposal after service, yet there is ready market at a price of about Kenya shillings 20 per litre. The effect of this is waste oil getting into wrong hands.

Untamed waste oils released in into the environment is likely to get into storm-drains or ground-water thereby directly affecting the ecosystem. Other than environmental degradation, human life too is threatened when considered that most waste oils contain some metals in addition to other poisonous compounds. Vehicle and machines life too is not spared either. Some used oil finds itself re-packed and returned onto shelves by unscrupulous vendors. Through this action not only is the lifeline of engines negatively impacted but also the economy ruined too. The above adverse consequences of unsound management of used oils are not only significant but also long-lasting.

Sound used oil management entails proper waste oil collection at the location of production; proper transportation to the designated storage site and safe disposal in accordance to the legislation. The three activities could be summed up as waste oil management triangle since all are equally important for sound waste oil management to surfice. For instance, whereas collection may be effective, lack of transportation or disposal process will result in a failure of the entire process.

Of the three however, waste oil transportation appears the most challengeful. Transportation of liquid in bulk has to content with the strong competition from fuels whose daily volumes are high and hence business lucrative. Waste oils in particular would require dedication of tankers; such that the tanker used for waste oil is not deployed in the fuels transport to avoid fuel contamination. Owing to their minimal daily volumes and the impact of tying down tankers through dedication, waste oil transport may not attract many transporters for the noble purpose.

With the resolved bottle neck of transport, storage is yet another concern which offers an interface between the collection and disposal. It is a requirement for a storage facility to meet minimum basic requirements for petroleum storage facility (though not necessarily highly flammable products) over and above the relevant environmental approvals. From storage, waste oil is dispatched to the safe disposal point in a recommended way.

Considering current situation of waste oil in Kenya and the possible benefits acrued from the initiative, there is need to establish sound waste oil management programme.

2.10.5.2 Hazardous waste from oils

Hazardous wastes from industry – large and small scale – typically pose risks because of their volume. However, some smaller quantities of wastes pose a risk, simply because of their ubiquitous nature. The greatest of these are garages, petrol stations and oil depots because of release into waster courses. Table 2.E shows the possible destination of used oil.

Table 2.11 Possible Distribution of Used Oil

Annual Quantity of Used Oil Generated in Kenya

Approximate quantities of used oil generated in Kenya ('000 Liters)

SECTOR	Nairobi	Mombasa	Kisumu	Eldoret	Nakuru	Mt. Kenya	Total
Retail Outlets	4,166	1,250	667	500	500	1,250	8,332
Distributors	4,520	753	1,507	0	753	0	7,534
Commercial	3,623	1,610	1,208	805	805	0	8,052
Manufacturing	3,785	1,262	946	0	315	0	6,309
Bunkers	0	478	0	0	0	0	478
SALES	16,095	5,353	4,328	1,305	2,374	1,250	30,705
Approximate quantity of used oil potentially available annually	**6,438**	**2,141**	**1,731**	**522**	**950**	**500**	**12,282**
Average used oil generated monthly	**537**	**178**	**144**	**44**	**79**	**42**	**1,024**

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Source: NUTEC Solutions, 2005, Personal communications

2.10.6 Health Care Wastes

Health care wastes – which include wastes from hospitals and nursing homes, dental surgeries and hospitals as well as veterinary care – pose particular risks. The greatest being their potential to have toxic metals such as mercury, cadmium, arsenic etc. coming from electrical and electronic waste. Typical sources include dental amalgams, batteries etc.[15]

The non-industrial waste sources can be found in every town, although the quantities may be small enough to be insignificant and often they are simply discarded with household solid waste.Smaller sources have the problem of being far more dispersed, with the potential for widespread low-level contamination of land, water and air. They may include paints, varnishing, spray cans, emptied containers etc. The other well dispersed waste stream is waste oil. Repair and maintenance services such as garages, petrol stations and repair shops are the main sources of waste oil and oil contaminated solid wastes. These are often disposed off in dumpsites. It is estimated that less than 10% of waste oil generated is actually collected which is approximately 33,000 tonnes/yr. There are also no recycling facilities in Kenya as the two that were there (Optimum Lubricants and Coast Oil have long closed).

2.11 Comments and Analysis

Considerable progress has been made with respect to the policy and legal/regulatory framework for SWM over the last few years, however. Thus, EMCA (1999) allocates considerable property rights as far as various aspects of environmental management are concerned. The most important of these is the right to clean environment allocated to the citizens. The citizens can now compel polluters, including indiscriminate solid waste dumpers, to pay for the damage or nuisance caused. In reality, however, the cost of litigation makes it difficult for most of the citizens to exercise this right.

[15] NIP for Stockholm Convention

3 CHAPTER 3: PRIORITY CONCERNS RELATED TO CHEMICAL PRODUCTION, IMPORT, EXPORT, TRADE AND USE

3.1 Introduction

This Chapter provides an overview of the nature of problems associated with chemical production, trade and use in Kenya. Information contained is based on inventories from the government ministries, national archives and research findings. The views have been gathered through stakeholder consultations nationally and regionally.

3.2 Chemicals and Human health

Chemicals in the environmental media present a threat to human health and the surrounding natural resources. The health of animals and humans are affected when they drink or bathe in contaminated water. Contamination in the soil can harm plants when they take up the contamination through the roots. Ingesting, inhaling, or touching contaminated soils, as well as eating plants or animals that have accumulated the soil contaminants can adversely impact the health of humans and animals. In summary the industrial toxic emissions and poisonous effluent discharge affects humans in nine major ways, general irritation of the eyes, redness/itchiness; Irritation of respiratory tract, inflamed mucous membranes, disturbances of respiration and cancer of respiratory tract; Erratic heart rhythm /bloated heart vessels; Erratic thyroid hormone production; Eczema of the skin, dermatitis, unexplained itchiness of the skin; Irreversible damage of brain or death in extreme poisoning; Softening of skeletal bones especially in elderly malnourished females; Acute renal tubular necrosis and general to severe renal dysfunction and Chronic liver hemorrhage sometimes fatal in acute cases.For Africa the burden of disease across Africa as obtained from a situational analysis and needs assessment(SANA) reports[16] of 12 African counties is shown in Table 1. Priority Concerns Related to Chemical production

As Kenya continues on its path of economic development, production and use of chemicals is likely to be the most significant factor that could bring about negative impact and risks to human health and the environment unless concerns pertaining to the management of chemicals are not addressed. The magnitude of this impact will depend on volume, quality and quantity of the chemicals used acting either as one or synergistically with other chemicals. It will also depend on the level of investment in minimization of the hazards and risks posed by those chemicals. It is estimated that over 350,000 cases of pesticide poisoning occur every year affecting 5 million workers engaged in agriculture (Government of Kenya (2), 2008)[17]. The associated loss in man hours, costs medical treatment etc amounts to over Ksh.336 million.

These can be attributed to the following causes;

- Quality of the air
- Quality of water and wastewater treatment and discharges
- Disasters in the environment
- Soil pollution and degradation

Chemical substances dangerous to the environment. The contamination is both at household, working place and the ambient environment.

[16] The First Inter-Ministerial Conference on Health and Environment in Africa held in Libreville, August 2008,

[17] Kalonzo Musyoka, Minister for Environment Statement to the 2nd Session of Intergovernmental Negotiating Committee for SAICM, UNEP 2004

Table 3.1: Burden of disease attributable to environmental factors for selected diseases in the African Region, estimates for 2004 [a]

	Total deaths	Deaths in children 0-14 y	Total DALYs	DALYs in children 0-14 y
Population (millions)	738 (000)	318 (000)	738 (000)	318 (000)
Total deaths/DALYs (all causes)	11 248	5 200	376 525	215 065
Total environmental deaths/DALYs	3 148	1 939	106 495	77 885
% environmental deaths/DALYs	28%	37%	28%	36%
Respiratory infections	584	432	17 463	15 487
Intestinal nematode infections	0	0	1 528	1 369
Tuberculosis	65	9	1 765	346
Mental retardation, lead-caused	0	0	918	918
Other neuropsychiatric disorders	17	3	2 599	278
Cardiovascular diseases	178	3	2 150	151
Road traffic accidents	84	28	2 945	1 331
Other unintentional injuries	140	51	5 846	2 759
Others	386	99	12 425	4 761

Analysis of the country chemical reports reveal use that both indoor and outdoor air pollution remain a challenge in Africa. Indoor air pollution is primarily due to use of biomass fuels (firewood, crops residues, and animal cow dung) for cooking and heating. This form of air pollution is attributed to a number of health conditions including lung cancer, cataracts , eyes irritations, skin diseases, increase acute respiratory illness and aggravation of asthma (especially in children), as well as asphyxiation, with a possibility of death.

3.2.1 Impacts of Cement, Lime and Related Production

Outdoor air pollution results from elevated level of fine particulate matter (PM10 and PM2.5) in ambient air, typically emitted by vehicles, open air burning of waste and other materials, industrial and energy generation processes. Collectively they are associated with increased daily and long term premature mortality due to cardio-pulmonary diseases, acute respiratory infections and cancers.

Air pollution is the addition of harmful substances into the air we breathe. This is associated with solid fuel use and the emissions that come out of it. Eighty per cent of Kenyans use wood fuel and therefore this poses a major risk. Further the nature of the construction of the grass thatched house reduces air circulation considerably**.** Heating and cooking in residential households with biomass is common practice in Kenya. Over 74% of the people in the rural areas rely on biomass energy for cooking and heating. Wood fuel provides the bulk of total primary energy (about 70%) and meets 93% of the rural household energy requirements (Kituyi et al 2001). Agricultural and forest wastes are also used as fuel. In many urban areas, sawdust is used as fuel and so are plastics. In all these cases, 90% of the combustion takes place on the traditional three stonnee fireplace designs.

Outdoor air pollution is of major concern worldwide. Elevated levels of fine particulates in ambient air typically emitted by vehicles, industry and energy generation have been associated with increases in cardiopulmonary diseases, acute and respiratory infections.

There are two types of particulate matter (PM): $PM_{2.5}$ (respirable) and PM_{10} (inhalable). Particulates are the biggest problem in Nairobi at the moment due to high levels emitted from vehicles and industries[18]. These PM have adverse health implications on human population and the environment. Gaseous pollutants (e.g. Nitrogen Oxide) exiting through the exhaust system as un-burnt by-products of *fossil fuels* interact with sunlight to form photochemical smog. The most destructive components of photochemical smog are ozone (O_3) and peroxy acetylnitrates. Both cause destructive changes in both living and non-living things. (For example, they cause eye irritation, destroy the green pigment called chlorophyll in plants and cause respiratory diseases due to injuries to lung tissues in humans and animals); Non-Methane Hydrocarbons (NMHCs): These are considered indirect Green House Gases (GHG) and are generated through a chemical transformation in the atmosphere. They have adverse effects on human health (carcinogenic problem). High Concentrations of Particulate Matter (PM), in all sites in Nairobi City and environs falls within the range 333.8 – 581.3 µg/m3 which exceeds the World Health Organization (WHO) limits of 150 -201 µg/m3. Since the Total Suspended Particulate (TSP) levels for Nairobi City and environs exceeds WHO limits, this situation poses a real threat to human health

3.2.2 Water Pollution

Perhaps water pollution is the biggest indicator of chemical pollution or lack of it. The water and environment policies and legislation devote quite considerable e currency to waters quality standards and guideline ns, water pot ability and effluent treatment

Most commonly reported cause of water pollution is due to inadequate chemical waste management since significant proportion of the urban population has poor access to proper solid waste management and sanitation. Poorly managed waste presents a health risk to communities. Ground water is commonly contaminated in most peri-urban and informal settlements, leading to potentially high levels of coliform counts in drinking water. This is primarily because untreated waste and waste that remains uncollected or improperly disposed of can be a source of chemical and/or organic contaminants.

a) **Nitrates**: These are one of the most common groundwater contaminants in rural areas. They are regulated in drinking water primarily because excess levels can cause methaemoglobinemia, or "blue baby" disease. Although nitrate levels that affect infants do not pose a direct threat to older children. Nitrates in drinking water start affecting the health of the general populace at levels in the range of 100 to 200 mg/l nitrate-N, but the effect on any given person depends on many factors, including other sources of nitrate and nitrite in the diet. Some of the nitrates consumed can be converted in the body to nitrites, which under appropriate circumstances can combine with amines (portions of protein molecules often found in foods, medications, cigarette smoke, decaying plants, soil, and sometimes water) to form nitrosamines, which are known to be carcinogenic. Nitrate contamination is prevalent in the whole of North Eastern Province.

b) **Fluoride**s: These occur in high levels naturally in central Kenya causing the mottling of teeth, a condition referred to as dental fluorosis
c) **Pesticides**: The exposure to pesticides occurs in the workplace, during manufacturing, packaging, mixing, storage and transportation. It may similarly occur during application

[18] Mukabana, Air pollution in Nairobi

or from accidental or deliberate exposure through food, air and water, resulting into either acute or chronic toxic effects. The table below presents the pesticide poisoning data as reported by the Government Chemist in

Figure 8 below shows examples of environmental effects of unmanaged dumpsites

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Figure 3.1 Environmental Effects of Unmanaged Dump Sites

Additional risks can also occur from direct contact with toxicants from poorly managed wastes such as, batteries and vehicle tyres. Of particular concern is scavenging in waste disposal sites, which involves manual sorting of waste to recover sellable or reusable components, and the handling of waste from health care facilities.

Problems related to pesticides are mainly found in the rural areas, since most pesticides are crop specific and therefore used in specific regions/zones. In addition the comparatively lower levels of education and hence understanding of risks posed by improper usage of pesticides. Likewise urban and industrial centres are prone to industrial chemical pollution where most industries are located. The level of personal protection equipment is still a matter of serious concern as personal protection is equipment is often lacking.

3) It has been noted that air pollution is on the increase mostly in urban areas due to increased vehicular traffic and industrial emissions. In addition, there are problems related to airborne particulate matter from mining activities. Air quality standards are still not yet in force.

4) Absence of a licensing body for chemicals dealers (with the exception of PCPB for pesticides and Pharmacy and Poison Board for pharmaceuticals), leaves room for chemicals not falling under these categories to be imported unregistered and subsequently are not monitored when used e.g hydroquinone's used in skin lightening products.

Table 3.1: Deaths attributable to Pesticide Poisoning with more than 1 death

Some of the pesticides deaths have been caused by Pesticide	Deaths
Cyhalothrin	18
Chlorpyrifos	10
Carbofuran	17
Diazinon	17
Chlorfenvinphos	4
Propoxur	3
Methomyl	2
Amitraz	4
Carbaryl	5
Unidentified OC	3
Unidentified OP	
Ethion	
Total	**87**

Source: Situation Analysis on Sound Management of Pesticides in Kenya. 2008

3.3 Priority Concerns

The main concerns related to production, import and use of chemicals include:

i) Weak laws to regulate the manufacture export, import, distribution and use of all chemicals in the country to control worker exposure and releases to the environment.
ii) Review or strengthening of boards which are concerned with regulation of import of chemicals so that illegal imports of severely restricted chemicals is minimized.
iii) Implementation of UNEPs guidelines on chemical management, especially the principle of Prior Informed Consent (PIC) which prohibits the export of potentially harmful chemicals which are unacceptable for domestic purposes in the exporting country, without the knowledge and consent of the appropriate authorities in importing countries;
iv) Curtailing trans-boundary harmful effects of chemicals including hazardous waste;
v) Monitoring chemical usage so that wise use of chemicals is applied.
vi) Awareness on proper and safe use of chemicals among workers and those around;
vii) Cultivating goodwill and collaboration among manufacturers, distributors and the local communities to achieve proper management of chemicals and good understanding of how chemicals are harmful

These impacts are restricted to the agricultural sector also affects human settlements located within areas of agricultural activities e.g. plantations.

Table 3.1 summarizes the main areas of concern related to management of chemicals. Such as

- Importation of more pesticides than needed
- Dumping of empty containers formerly used to store pesticides into waterways

- Use of pesticides containers to store food and drinks
- Poor storage and handling of pesticides

Table 3.2: Description of Problem Areas (Agro-chemicals/Pesticides)

Nature of the problem	Region	Brief description of problem	Chemical/ Pollutants
Air pollution	National	• Burning of pesticides & pesticides packaging in dumpsites. • Aerial Spraying	Pesticides
Pollution of Inland waterways	National	• Use of pesticides near waterways • .	Pesticides
Marine pollution	Coastal	• Use of pesticides in illegal fishing • Waterways link up into ocean	Waste, oil, heavy metals
Ground-water pollution	National	• Infiltration of contaminated water	Pesticides
Soil contamination	National	• Dumping of pesticide packaging materials.	Pesticides
Pesticides residues in food	National	• Excessive use of pesticides	Herbicides
Occupational health: agriculture & Public health	National	• Lack of awareness on dangers of pesticides • Lack of safety gears	Agro-chemicals
Storage / disposal of obsolete pesticides	National	• Lack of proper disposal facilities • Lack of adequate storage facility	Pesticides
Pesticides poisoning/ suicides	National	• Misuse of pesticides • Lack of awareness	All toxic Chemicals
Persistent organic Pollutants	National	• Lack of proper disposal facilities • Lack of adequate storage facility	Pesticides POPs

Top priority issues are shown in Table 3B

Table 3.3 Concerns Related to Chemical Production, Import, Export, Trade and Use

Nature of the problem	Region	Brief description of problem	Chemical/pollutants
Air pollution	National	• Burning of industrial chemicals packaging • Factory emissions • Emissions from residential houses	Industrial and other consumer chemicals. Lead, Sulphur oxides Heavy metals
Pollution of inland waterways	National	• Discharge of untreated effluents • Dumping of chemicals with domestic waste	Mercury, arsenic, lead, Heavy metals, pesticides
Marine pollution	Regional	Waterways link up into lakes and ocean	Heavy metals Pesticides
Ground-water pollution	National	Infiltration of contaminated water	Leach ate of POPs and heavy metals
Soil contamination	National	• Transportation to ground water • Dumping of chemicals packaging materials.	All industrial hotspots Emissions such as POPs, metals, acids
Chemical residues in food	National	• Excessive use of food additives • Use of effluent in irrigation	Expired Foods and food packaging
Drinking water contamination	National	• Waterways are source of drinking water • No treatment of water in the villages and in adequate treatment in major towns	Metals, Organic compounds Nitrates Fluoride
Hazardous waste treatment / disposal	National	• Lack of proper disposal facilities • Lack of appropriate treatment technologies	Heavy metals Pesticides
Occupation health :industrial	National	• Inadequate/inappropriate protective gears.	Acids, alkaline Gaseous emissions of metals/non metals
Public health	National	• Misuse of skin tonneing chemicals	Cosmetics, mercury
Chemical accidents : industrial	National	• Poor storage. • Lack of proper disposal facilities •	Various Obsolete pesticides
Chemical accidents : transport	National	• Road accidents. • Poor storage.	Acids/gases
Storage / disposal of obsolete chemicals	National	• Importing more chemicals than needed. • Lack of proper disposal facilities • Lack of adequate storage facility	Various Obsolete pesticides
Chemical poisoning/ suicides	National	• Lack of awareness • Poor storage and handling of chemicals • Use of chemical containers to store food and drinks	Pesticides Arsenic Mercury
Persistent organic Pollutants	National	• Lack of proper disposal facilities • Lack of adequate storage facility	PCB, HCB, chlorinated compounds

The following are priority concerns that cut across all sectors for all chemicals.

Table 3.4: Priority Concerns Related To Chemicals

Nature of Problem	Scale of Problem	Level of Concern	Ability to Control Problem	Availability of Statistical Data	Specific Chemicals Creating Concerns	Priority Ranking
Air pollution	National	Medium	Low	Insufficient	CO, SO_x,NO_x, PCDD	1
Marine pollution	Regional	Medium	Low	Insufficient	Oil	2
Ground-water pollution	National	Medium	Low	Insufficient	Fluorides	
Storage/disposal of obsolete pesticides	National	High	Low	Insufficient	Persistent Organic Pollutants	1
Drinking water contamination	National	High	Low	Insufficient	Fluorides, arsenic, nitrates, Organics	2
Soil contamination	National	High	Low	Insufficient	Pesticides, Acids	3
Hazardous waste treatment / disposal	Regional	High	Low	Insufficient	Organic and inorganic	1
Occupational health: agriculture	National	High	Low	Insufficient	Agrochemicals	5
Chemical residues in food	National	Medium	Low	Insufficient	Organic and inorganic	4
Occupation health :industrial	Regional	Medium	low	Insufficient	Paints, lacquers, chromes	1
Public health	National	High	Low	Insufficient	Plastics	1
Pesticides accidents industrial	National	Medium	Low	Insufficient	Explosions, fires	3
Pesticides accidents transport	National	Low	low	Insufficient	All	2
Air pollution	National	Medium	Low	Insufficient	All	1
Pesticides poisoning/ suicides	National	Medium	Medium	Insufficient	All	1
Persistent organic pollutants	National	Medium	Medium	Insufficient	All	2

3.4 Stakeholder Priority Concerns

Consultations with stakeholders in provinces raised various points concern and possible way forward for their respective regions. Points included;

i) Capacity building for the management of toxic chemicals at regional level
ii) Setting up of chemicals management committees at the district and municipality levels.
iii) Ways of sensitization of the population on the dangers of chemicals especially their dangers associated with their mismanagement when using them.
iv) Having budgets set aside for handling of chemical issues within the provincial regions.
v) Having disaster preparedness mechanisms in place.
vi) Mainstreaming chemicals in development process
vii) Prioritizing chemical issues

Stakeholder discussions in the different regions raised varied areas of concern and proposed the following recommendations:

a) Nyanza Region

i. Form a Nyanza Province Chemicals Coordinating committee
ii. Undertake capacity building and assessment.
iii. Establish at least one well equipped laboratory able to analyze majority of chemical parameters of concern in the region
iv. Establish a Nyanza Province Chemicals information Centre
v. Develop a partnership project Mercury.
vi. Create public and institutional awareness on chemicals, wastes and MEA's.
vii. Request LVEMP (commissions) to set up capacity building activities that address chemical management issues
viii. Set up disaster management strategies and especially focused on chemical activities occurring within the region.
ix. Include in the chemical activities in the budgetary negotiations cycle.
x. Strengthen monitoring trans-boundary movement of controlled and regulated chemicals across and between the five three East African states.

b) Coast Region

i. Set up of the regional coordination committee for management of chemicals and wastes in the coast region.
ii. Inventorying the existing infrastructural capacity, industries and wastes generated in the coastal region for easy decision making.
iii. Creating public awareness activities on chemical and wastes generation Establish mechanism for capacity building for the region prioritizing fishermen, farmers and factory workers.
iv. Establish data access facility to document chemical information in the region.
v. Strengthen chemical and waste disaster management and preparedness.
vi. Develop chemical management infrastructure such as analytical laboratories.
vii. Strengthen enforcement of the legal instruments on chemical Coordinating monitoring and surveillance mechanism of chemicals management activities and audits reports.
viii. Organise sensitization workshop on projects on waste in the coastal region.

Rift Valley Region

i. For pesticides, most data, response and awareness is based in Nairobi. The system needs to go to the provinces and districts.

ii. The Nakuru municipality used to run a Pollutant Release and Transfer Register for pollutants entering the Lake Nakuru. It should be revived.

iii. There were cases of suspected rebranding of banned and restricted chemicals. It should be investigated and corrected.

iv. The list of banned and restricted chemicals agro chemicals although in the website of PCPB is not in the public domain for farmers. An updated version should be, especially with regard to the list of chemicals listed in the Stockholm convention.

v. A report on gaseous emissions from geothermal power generation station is important for long term monitoring.

vi. It was stated that some facilities have chemical wastes but they do not know how to dispose it. An inventory of such facilities is necessary.

vii. It was noted that only large flower farms get attention. The small scale ones also need equal attention, especially with regard to personal protection equipment.

viii. There was discussion on monitoring of Cholinesterase levels in blood ng abused. Awareness as to its importance is necessary.

ix. There is no dedicated budge at provincial and district levels for chemical management. This should be reviewed.

x. Need for environmental awareness and education on chemicals management at provincial and district levels to be coordinated by PDE's office.

xi. Need for strengthening the regional information centre

c) Western Region

i. Provincial Chemical Awareness campaign to be lead by the PDE.
ii. Training of Chemical Emergency Preparedness
iii. Evaluation of budgetary provisions specific for chemical programs and hazardous waste in the Annual Operational Plan.
iv. Project and concept paper for GEF on Pan Paper disposal of expired chemicals.
v. Inventory of chemicals used in Western Province – Action PDE
vi. Exchange of information from programs monitoring water pollution and air. (disseminate standards and regulations on air quality) – Action PDE
vii. Survey of the waste generation from the Local Authority and Private Sector.
viii. Capacity building especially on equipment for emergency preparedness.
ix. Provincial Authorities to come up with designated landfills to cater for the entire waste disposal

3.5 Comments / Analysis

The information currently available is not sufficient enough to accurately indicate the magnitude of problems of chemical management in Kenya. This can be attributed to the following reasons:

i. Most of the available information is not readily accessible as it is tied under institutional secrecy and needs to be made public.
ii. Lack of data on industrial and consumer chemicals because of use of code words
iii. Lack of data on actual needs and actual supply because of nature of entry of data in many national statistics.
iv. Insufficient information of stocks from importers because they import is only on demand
v. Scanty data and information on obsolete chemicals and their disposal.
vi. Absence of a register of importers and distributors of chemicals.

vii. The Ministry of Medical Services and the Ministry of Public Health should urgently initiate detailed studies on cases of cancer in North Eastern province, their cause, occurrence and mitigation measures.
viii. From now on, any identified case of oesophagus cancer should be reported to a central database and reviewed fortnightly.
ix. The Ministry of Water and Irrigation, University of Nairobi and Government Chemist to carry out full analysis of all the samples carried by the team. Mine & Geological Dept of MEMR also to test.
x. The community be sensitized to report all diagnosed and confirmed cases of cancer to health facilities to be recorded at the District Health records.

4 CHAPTER 4: LEGAL INSTRUMENTS AND NON-REGULATORY MECHANISMS FOR MANAGING CHEMICALS

4.1 Introduction

This section provides the overview of the existing legal instruments and non-regulatory mechanisms for managing chemicals including implementation and enforcement. It also identifies the relevant strengths, weaknesses and gaps.

4.2 Overview of the National Legal Instruments

The regulatory mechanisms for chemical management in Kenya dates back to the pre-colonial rule when several ordinances were put in place to control the general use and handling of chemicals. Historical records show that the first British Government legislation was the Public Health Act enacted in place in 1921 to protect human and regulate the use of pesticides by farmers in Kenya (Wandiga, 2001).
The Ministry of Environment and Natural Resources (MEMR) has been operating in an environment delineated by various national policy papers and legislation including the Sessional Paper No. 6 on Environment and Development (1999), The Forest Act (Cap 385), The Mining Act (Cap 306), The Water Act of 2002, Kenya Forestry Master Plan, Environmental Management and Co-ordination Act (1999),

The National Environment Action Plan (NEAP - 1994) and the Kenya Forestry Policy. Several other policies and legislation that are supportive of environmental policy and legislation are health, industry, trade; local government as well as land is in play. They also support chemicals management as indicated according to its strategic plan[19]. The Ministry in its strategic plan indicated that it will continue to take necessary interventions with a view to achieving implementation of the Environmental Management and Coordination Act 1999; universal implementation of Environmental Impact Assessments and Environmental Audits and compliance and enforcement of environmental regulations, guidelines and standards;

The enforcement is however very critical. It has indicated that it will put more energy to:

- Prosecution of offenders failing to meet the provisions of EMCA(1999), environmental standards, regulations and guidelines;
- Coordination of environmental matters amongst all lead agencies/stakeholders;
- Environmental planning, research, inventorying and monitoring;
- Implementation of actions in the Multilateral Environment Agreements on chemicals and wastes;
- Integration of environmental concerns into national development policies, plans and programmes;
- Establishment of an award scheme for best environment practices among individuals, and , Organizations at district, provincial and national levels.

Table 4.1 below shows the summary of various legal instruments and subsidiary regulations for managing chemicals in Kenya.

[19] www.mazingiraasili.go.ke, MENR Strategic Plan 2006-2010

Table 4.1 Relevant Chemical Legislation That Will Support Saicm Policy

Legal regulatory /Instruments	**Responsible party**
Sessional Paper No. 6 of 1996 on Environment and Development	Ministry of Environment
National Environmental Sanitation and Hygiene Policy, 2007	MOPHS
National Policy on Injection Safety and Medical Waste Management,	MOPHS
Occupational health and safety Policy, 2007	Ministry Of Labor, Dohss
Bio safety Policy	Ministry Of Agriculture
Water Act, 2002	Ministry Of Water
Environmental Management and Coordination Act , 1999	Ministry Of Environment
The Pest Control and Products Act, Cap 346	Ministry Of Agriculture, Pcpb
Energy Act, 2006	Ministry Of Energy
Radiation Protection Act	Ministry Of Environment
Explosives Act	Ministry Of Environment
Revenue Act	Kra
Traffic Act Cap, 403	Ministry Of Transport
Finance Act	Ministry. Of Finance
Standards Act	Ministry Of I,Industries
Trade Act	Min. Of. Trade
Waste management regulation, 2006	NEMA
Pesticides disposal regulation	PCPB
Non-Regulatory mechanisms for managing chemicals	**Institutions**
Hazardous gaseous emission awards	National Cleaner
Energy efficiency awards	Kenya Association Of Manufacturers
Code of practice on distribution and transport and disposal of pesticides	PCPB
Voluntary code of conduct for businesses around lake Victoria basin region	KNCPC

The following are Ministerial responsibilities with regard to chemicals.

i) Ministry of Health (Malaria Control Programme): The Ministry provides policy guidelines on human health in Kenya.
ii) Ministry of Trade and Industry (MT&I). The Ministry regulates and enforces trade regulations both local and international.
iii) Ministry of Agriculture (MOA).The Ministry is mandated to oversee sustainable agricultural practices and use of agrochemicals.
iv) Ministry of Labor. The Ministry handles matters related to workers health and exposure to Chemicals and related issues.
v) Ministry of Local Government Authorities. The Ministry regulates the functioning of all city councils, municipal councils and town councils in the country and especially waste treatment and disinfections.

Table 4.2: References to Existing Legal Instruments Which Address the Management of Chemicals

Legal Instruments	Responsible ministries	Chemical use categories	Objective of legislation	Relevant articles/ provision	Resources allocated	Enforcement ranking
Environmental management and Co ordination Act,(EMCA) No.8 of 1999	NEMA	Industrial Chemicals	legal and institutional framework for the management of the environment	Section 92,93	Inadequate	Ineffective
Occupational Health and Safety Act LN. 60 of 2007	(DOHSS)	Chemical Concentration in Work Places	To ensure safety at Work places for workers	Sections	Inadequate	Fair
Pest Control Products Act, Cap 346	PCPB	Agricultural Chemicals	To regulate the importation, exportation, manufacture, distribution	Section 4	Adequate	Effective
Public Health Act, Cap 242	MOLG	Human and , Veterinary Chemicals	Securing and maintaining health	Sections 10 and 13	Adequate	Effective
Food, Drugs and Chemical Substances Act, Cap 254	MHLG	Pesticides and other Industrial Chemicals	to make provision for the prevention of adulteration of food, drugs and chemical substances	Sections 5,10,14 and 22	inadequate	Fair
Pharmacy and Poisons Act, Cap 244	Ministry of Health, Livestock	Human and veterinary medicine	Control of the profession of pharmacy and trade in drugs and poisons	Sections under Part II and III	Adequate	Effective
Use of Poisonous Substances Act, Cap 247	Ministry of health	Human chemicals in work places	To provide for the protection of persons against risks of poisoning by certain substances	Sections 3,4	Inadequate	Not effective
Water Act, 2002	Ministry of water	Domestic, /Commercial	To provide safe drinking water a		Adequate	Effective
Fertilizers and Animal Food stuffs Act, Cap 345	MoA	Veterinary and agricultural	To regulate the importation, manufacture and sale of agricultural fertilizers and animal foodstuffs.	Sections 3,4,5		Fair
The Agriculture Act,	MOA	Agricultural			Adequate	Effective
Standards Act, Cap 496	Ministry of Industry and Trade,	Industrial, commercial	to promote the standardization of the specification of commodities,	Sections 10,14	Adequate	Fair

In addition to regulatory mechanism, there are a number of non-regulatory mechanisms that support chemical management in the country on voluntary basis. The table 4.B shows the summary of non regulatory mechanisms.

Table 4.3 Non-regulatory Mechanisms that support chemical management in Kenya

Non-Regulatory mechanisms for managing chemicals	**Institution(s) Involved**
Hazardous gaseous emission awards	National Cleaner Production Centre
Energy efficiency awards	Kenya Association of Manufacturers
Code of practice on distribution and transport and disposal of pesticides	PCPB
Voluntary code of conduct for businesses around lake Victoria basin region	KNCPC
ISO-14001 EMS Certification	KEBS, SGS,
Hazard Analysis Critical Control Point	Federation of Kenya Employers
ISO 900O Series*	KEBS, SGS
Environmental Action Plan	NEMA
Cleaner Production & Resource Efficiency	KNCPC
Company of the Year Award(COYA)	Kenya Institute of Management NEMA

4.3 Description of Key Legal Instruments Relating to Chemicals

Various legal instruments in Kenya cover different chemical categories.

4.3.1 Environmental Management and Co ordination Act, (EMCA No.8 of 1999

The major chemicals categories covered under the Act include industrial fertilizers, consumer chemicals, petroleum products and chemical wastes.

The regulatory procedures provided for under this legal instrument include requirement to undertake the Environmental impact assessment for proposed chemical industries and periodic submission of Environmental Audit reports. Others include preparation and implementation of the five year National, Provincial and District Environment Action Plans (NEAP, PEAP, and DEAP). In addition, the National Environment Management Authority prepares an annual State of Environment Report.

Inspection and investigation is undertaken to identify non compliance for enforcement purposes including prosecution which may lead to fines, revocation of licences, closure of facilities or imprisonment.

- Environmental Impact/Audit Assessment Regulations, 2003
- Waste Management Regulations, 2006
- Water Quality Regulations, 2006
- Controlled (ODS) Regulations, 2007

4.3.2 Pest Control Products Act, Cap 346

An Act of Parliament to regulate the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic function of plants and animals and for connected purposes. ***Pesticide regulatory aspects***

The national pesticide regulation, Pest Control Products Act, CAP 346 of 1982 provides a reasonable basis for the management of pesticides in Kenya. A number of issues, however, will need strengthening in the short or medium term.

The pesticide registration system that was set up in 1982 and does not address the current needs..An efficient administrative framework has been developed, ensuring cooperation between various ministries. However, the registration system is understaffed and needs further technical capacity building in almost all areas of pesticide evaluation. In the medium term, a more scientifically sound pesticide registration process would result in fewer pesticides posing an unacceptable risk to human health and the environment from being authorized in Kenya.

A major weakness in the pesticide regulatory system is the absence of effective compliance monitoring and enforcement of pesticide legislation. The number of staff assigned to carry out pesticide inspections and control is extremely limited and there is a great need for capacity building in this field. The weakness in compliance monitoring and enforcement may lead to illegal imports of pesticides, unsafe pesticide storage and inappropriate distribution or use. It also creates an uneven playing field between companies that comply with legislation and others that do not, with the non-compliers potentially having unfair competitive advantage.
In spite of strengthened pesticide registration procedures, several pesticides are still being usedwhich can be considered highly hazardous, in particular under the local use conditions. Theseinclude (but are not limited to) endosulfan, profenofos, paraquat. These pesticides are oftenused by small-scale farmers with limited or no training and protective equipment. Reducing therisks of such pesticides, either by improving their use or by replacing them with lower riskalternatives, is a major challenge.

Establishing a system for reporting and recording of incidences of human, animal and Environmental contamination by pesticides would also greatly benefit Kenyan authorities and assist in the process of identifying pesticides that pose high risks under conditions of use in Kenya. Such a process would also support Kenyan compliance with and contribution to the Rotterdam Convention which it has recently ratified.
The Government of Kenya has shown over the last decade that it is capable of taking sound pesticide management very seriously. Several regulatory instruments have been put into place or updated, and decision making for pesticide authorization has been greatly improved. Similarly, the Government sought assistance from FAO and the donor community toeliminate its substantial stockpile of obsolete pesticides. However, considerable quantities of highly hazardous pesticides are still being used in the country. There is an urgent need to look for alternatives to these pesticides so that they can be replaced without compromising agricultural production or disease vector control.

Under the legislation no person is allowed to:

a) Manufacture, package, store, display, distribute, use or advertise any pest control product except in accordance with conditions prescribed by regulations made under the Act.
b) Package, label or advertise any pest control product in a manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character, value, quality, composition, merit or safety.
c) Import into, or sell in, Kenya any pest control product unless that product has been registered, packaged and labelled in accordance with regulations made under the Act and conforms to the standards specified in those regulations.
d) Export or re-export out of Kenya any pest control product unless he has complied with the requirements specified in regulations made under the Act.

Licensing of Premises Regulations, Labelling, Advertising and Packaging and importation and Exportations Regulations

4.3.3 Occupational Health and Safety Act LN 60 of 2007

Is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes.

Provisions for chemical safety require:

i. To establish safety and health requirements based on risk assessments, technical standards and medical opinion, for the safe handling and transportation of chemicals and other hazardous substances.

ii. Every manufacturer, importer, supplier or distributor of chemicals shall make available to employers, material safety data sheets for chemicals and other hazardous substances, containing detailed essential information regarding their identity, supplier, classification of hazards, safety precautions and emergency procedures.

iii. Every supplier of hazardous substances, whether as manufacturer, importer or distributor of hazardous substances shall ensure that containers filled with hazardous substances, are appropriately labeled and marked.

iv. Every supplier of chemicals whether as a manufacturer, importer or distributor shall ensure that all chemicals are classified according to their characteristics, properties such as toxicity, chemical, physical, corrosive and irritant; allergenic, sensitizing, carcinogenic teratogenic and mutagenic, effects as well as their effect on the reproductive systems;

- Safety and Health Committee Rules, 2004
- Hazardous Substances Rules, 2007
- Fire Risk Reduction Rules, 2007

4.4 Existing legislation by category addressing various stages of chemicals

Most of the existing legal instruments address various stages of chemical management from production/importation, storage, transportation, distribution, use and disposal. However the national capacities to ensure sound management of chemicals at various stages are inadequate.

4.5 Summary description of key approaches and procedures for control of chemicals

4.5.1 Environmental Management and Co ordination Act (EMCA 1999)

The major elements under EMCA 1999 include classification of toxic and hazardous chemicals and materials in accordance with their toxicity and the hazard they present to the human health and to the environment; registration of chemicals and materials; labeling of chemicals and materials; packaging for chemicals and materials; advertising of chemicals and materials; control of imports and exports of toxic and hazardous chemicals and materials permitted to be so imported or exported; distribution, storage, transportation and handling of chemicals and materials; monitoring of the effect of chemicals and their residue on human health and the environment; disposal of expired and surplus chemicals and materials; and restriction and banning of toxic and hazardous substances and energy.

4.5.2 Pest Control Products Act, Cap 346

The Pest Control Products Act of 1982 which created the Pest Control products Board in 1983 is the main regulatory organ for pesticides. Pest control products is defined as a "device, product, organism, substance or a thing that is manufactured for directly or indirectly controlling or preventing, destroying, attracting or repelling any pest. The Board regulates the importation, exportation, manufacture, distribution, and use of various pesticides in Kenya in all sectors of

Table 4.3 summaries the various instruments addressing the various stages of chemical management in Kenya.

Table 4.4 Existing Legislations by Use Category Addressing Various Stages of Chemicals

Category of Chemicals	legislation	Import	Production	Storage	Transport	Distribution/ Marketig	Use/ Handling	Disposal
Pesticides (Agricultural, Public Health and consumer Use)	Pest Control Products Act, Cap 346		X	X	X	X	X	X
Fertilizers	Fertilizers and Animal Foodstuffs Act Cap 345	X	X	X	X	X	X	X
Industrial Chemicals (Used in Manufacturing/ Processing)	Environmental Management and Coordination Act	X	X	X	X	X	X	X
Petroleum Products	Energy Act & Petroleum Rules	X	X	X	X	X	X	X
Consumer Chemicals		Food	Drugs and Chemical Substances Act	Cap 254	Food	X	Cap 254	Food
Chemical Wastes	Environmental Management and Co ordination Act, (EMCA)	X	X	X	X	X	X	X
Petroleum and Hydrocarbon	Petroleum Act	x		x	X	x	X	
Geothermal Energy	Energy Act		x				X	

agriculture and health or of organic functions of plants and animals. It is worth noting that prior to 1983 there were no provisions requiring the regulation of the use of pesticides in Kenya. The PCPB was established in 1982 through an Act of Parliament. It became operational in 1985 after the appointment of the secretariat.

4.5.3 Occupational Health and Safety Act L.N. 60 of 2007

The primary responsibility of this Directorate, whose vision is "a healthy worker in a safe working environment," is to ensure that all workplaces in the country are safe. It is the custodian of occupational health and safety matters. It promotes safe and healthy working environments by preventing accidents, occupational diseases, ill health and damage to property in order to reduce the cost of production and improve productivity in all workplaces.

4.5.4 Food, Drugs and Chemical Substances Act, Cap 254

This Act makes provision for the prevention of adulteration of food, drugs and chemical substances and for matters incidental thereto. By and large the law prohibits the sale of unwholesome, adulterated or poisonous food ad sets standards.

4.5.5 Fertilizers and Animal Food stuffs Act, Cap 345

This Act regulates the import, manufacture and sale of agricultural fertilizers and animal foodstuffs and substances of animal origin intended for the manufacture of such fertilizers and foodstuffs.

Table 4.5 below gives the summary of banned and restricted chemicals in Kenya

BANNED PESTICIDES IN KENYA			
	Common name	Use	Date Banned
1.	2,4,5 T (2,4,5 – Trichloro-phenoxybutyric acid)	Herbicide	1986
2.	5 Isomers of Hexachlorocyclo-hexane (HCH)	Fungicide	1986
3.	Aldrin	Insecticide	2004
4.	Benomyl,carbofuran,Thiram combinations	Dustable powder formulations containing a combination of Benomyl above 7%, Carbofuran above 10% and Thiram above 15%	2004
5.	Binapacryl	Miticide/Fumigant	2004
6.	Captafol	Fungicide	1989
7.	Chlordane	Insecticide	1986
8.	Chlordimeform	Insecticide	1986
9.	Chlorobenzilate	Miticide	2004
10.	DDT(Dichlorodiphenyl Trichloroethane)	Agriculture	1986
11.	Dibromochloropropane	Soil Fumigant	1986
12.	Dieldrin	Insecticide	2004
13.	Dinoseb and Dinoseb salts	Herbicide	2004
14.	DNOC and its salts (such as Ammonium Salt, Potassium salt & Sodium Salt)	Insecticide, Fungicide, Herbicide	2004
15.	Endrin	Insecticide	1986
16.	Ethyl Parathion	Insecticide and All formulations banned except for capsule suspensions	1988
17.	Ethylene dibromide	Soil Fumigant	1986
18.	Ethylene Dichloride	Fumigant	2004
19.	Ethylene Oxide	Fumigant	2004
20.	Fluoroacetamide	Rodenticide	2004
21.	Heptachlor	Insecticide	1986
22.	Hexachlorobenzene (HCB)	Fungicide	2004
23.	Mercury Compounds	Fungicides, seed treatment	2004
24.	Methyl Parathion	Insecticide. All formulations banned except for capsule suspensions	1988
25.	Monocrotophos	Insecticide/Acaricide, Soluble liquid formulations of the substance that exceeds 600g active ingredient/L	2004
26.	Pentachlorophenol	Herbicide	2004
	Phosphamidon	Insecticide, Soluble liquid formulations of the substance that exceed 1000g active ingredient/L	2004
27.	Toxaphene (Camphechlor)	Insecticide	1986

Table 4.5b Restricted Pesticides

RESTRICTED PESTICIDES IN KENYA		
	Common name	Remarks
1.	Benomyl, Carbofuran/Thiram combinations	Dustable powder formulations containing a combination of Benomyl below 7%, Carbofuran below 10% and Thiram below 15%
2.	DDT(Dichlorodiphenyl trichloroethane)	Insecticide, restricted use to Public Health only for mosquito control for indoor residual spray by Ministry of Health. Banned for agricultural use.
3.	Ethyl Parathion	Insecticide, capsule suspension formulations allowed in 1998
4.	Lindane-pure gamma – BHC	Insecticide, restricted use for seed dressing only
5.	Methyl parathion	Insecticide, capsule suspension formulations allowed in 1998
6.	Monocrotophos	Insecticide/acaricide, soluble liquid formulations of the substance that are below 600g active ingredient/L
7.	Phosphamidon	Insecticide, Soluble liquid formulations of the substance that is below1000g active ingredient/L

Source PCPB

4.6 Non Regulatory Mechanisms for management of Chemicals

4.6.1 Taking into account proposals and policies on development

Production and use of chemicals will continue to be the basis for economic development for Kenya in the foreseeable future. It follows therefore that chemicals will continue to impact on the lives of all people, the economy and the environment. The impact will depend on the type, volume, quality and quantity of the chemicals used acting either as one or synergistically with other chemicals. It will depend on the level of investment in minimization of the risks and hazards and dangers of those chemicals. The cross -sectoral nature of managing chemicals has necessitated the elaboration of norms in economic, social and technical areas of agriculture, health, industry etc. Therefore cross sectoral measures include:

4.6.2 A Strategic Action Plan on certain streams of waste has been taken on plastic and electronic waste

- A National Chemicals Policy Committee is under implementation to ensure stakeholder participation in the decision making process. The mandate of this Committee is to address elements contained in the overarching policy and strategy of SAICM.
- The biggest strides have been made on legal, policy and international aspects of multilateral environmental agreements with regulations being published for waste and water quality management and with others on chemicals management being in the pipeline.

4.6.3 Overlaps and gaps in the existing legislation on

The legal framework is characterised by overlaps in a number of areas. EMCA and the Pest Control Products Act both institute systems for registration and regulation of pesticides. The mandates of NEMA and PCPB overlap. In regard to the public health impacts of the use of chemicals and pesticides, both the Agriculture Act and the Occupational Health and Safety Act deal with the health and safety of agricultural workers. These are only two examples of overlaps. Such gaps as exist however can be filled in through the promulgation of regulations, which can be formulated as and when gaps are identified.

4.6.4 Effectiveness in enforcement of different pieces of legislation

The enforcement of laws is often inadequate. Many provisions of the law have not been utilised largely on account of limited enforcement capacity. An additional problem relates to limitations in the nature and content of the data required for enforcement purposes. The combination of these factors has meant that the enforcement of the laws has been limited.

4.6.5 Effectiveness of non-regulatory mechanisms in reducing chemical risks

Non-regulatory mechanisms have been effective in spurring compliance and have supplemented the regulatory mechanisms. However the non-regulatory mechanisms are few and far from comprehensive in their coverage. Consequently their effect has been limited.

4.6.6 Effectiveness of the existing laws in addressing national priorities on chemicals

As stated the national laws have had only limited effect in addressing national priorities on chemicals. This is on account of limitations in capacity arising from technical, financial and human resource constraints.

4.7 Comments and Analysis

There exists some instruments that provide directions on policy orientations, regulatory frameworks, intervention strategies and guidelines (plans). However, there are challenges in keeping some of the national tools up to date. In terms of priority needs, it is recommended that focus be on policy, human resources, legislation and regulation.There seems to be a wide array of regulations capable of regulating chemicals. There are many regulations touching on aspects of chemicals and hazardous waste. There are also institutions that implement those regulations. Their capacity to address the information on chemical risks need to be reviewed urgently. Stakeholders proposed actions that would involve reviewing and harmonizing existing chemical regulations to provide the basis for interministeral collaboration and coordination among the stakeholders. It is the capacity to comply, enforce and meet international commitments that is a challenge.Those instruments requiring immediate review/completion include Sessional Paper No. 6 of 1996 on Environment and Development; . Some of the laws and their regulations have not been updated. For instance, the fines and penalties are not deterrent. Capacity to enforce the regulations is inadequate and it is recommended that joint inspection teams be identified. In addition, there are inadequate financial and human resources under the environment sector.

5 CHAPTER5: MINISTRIES, AGENCIES AND OTHER INSTITUTIONS MANAGING CHEMICALS

5.1 Introduction

This chapter describes and analyses the mandates and programs of different ministries, agencies and other governmental institutions responsible for and concerned with various aspects of chemicals management. The government circular on ministries states that they are in charge of legislation and the execution of their respective mandates with the help of specialized agencies.

5.2 Responsibilities of Ministries, Agencies and Other Institutions

Various institutions in the country including government ministries and other agencies are charged with the responsibility of managing chemicals in the country. Key among these are the ministries that control pesticides use

Table 5.1 Ministries with Pesticide Mandates

No	Government Ministries	Specialized Departments	Role	Mandate
1	Ministry of Agriculture	Kenya Agricultural research Institute Kenya Tryponosomiasis Research Institute, Polycchlorinated Biphenyls, National Agricultural research Institute Kenya plant Healthn Inspectorate services	Pesticide/fertilizer, Registration of pesticides, Monitoring of pesticide residues	Agriculture Act/Pest control Production
2	Ministry of Health	Government Chemist. National malaria Control Program.KEMRI	Pesticide for yield analysis Pesticide tests for Malaria Research on medical impacts	Public Health Act Malaria Control Medical Research
3	Ministry of Environment& Natural Resources.	National Management Authority Kenya forestry Research Institute	Overall Environment Policy Toxic Chemicals Focal Point	Government Policy/EMCA
4	Ministry of Industry & Trade	Kenya Industrial Research Institute Kenya Bureau of Standards	Import, trade and production licensing Standards	Customs and Exercise act Standards Act
5	Ministry of Labor	Department of Occupational Health and Safety Services	Factory and chemicals use and Disposal	Health and Safety of workers

5.3 Ministries with specific manadates on chemicals and wastes

5.3.1 Ministry of Environment and Mineral Resources[1]

The ministry seeks to ensure that there is a clean, secure and sustainably managed environment and mineral resources conducive for national prosperity. In addition it seeks to

[1] IN charge of MEA's on chemicals i.e. The Montreal Protocol, Basel Convention, Stockholm Convention, Rotterdam Convention, SAICM

promote, monitor, conserve, protect and sustainably manage the environment and mineral resources for national development

There are several government departments under this ministry that address matters related to chemicals management. Key among them are Mines and Geology Department and NEMA

i) Mines and Geology[1].

Mines and Geology Department's oversees the exploitation and use of minerals in the country. Its core objectives are

- To formulate, implement and review existing policies and legislation.
- To develop geological and mineral resources databases.
- To sustainably manage mineral resources.
- To ensure public safety and optimal utilization of mineral resources for national development.
- To ensure safety and security of commercial explosives

5.3.2 NEMA[2]

NEMA is mandated under EMCA to manage the environment through supervision and coordination of the lead agencies-relevant ministries, government departments and agencies. This includes chemicals management by enforcing Environmental Impact assessments and audits where a threat to the environment is envisaged by the use of certain chemicals listed in the 2nd Schedule to the Act.

NEMA operates by way of regulating the various lead agencies, relevant ministries, government departments through EMCA and the several regulations formulated NEMA. It is not an implementing agency rather it seeks to coordinate the implementation of policies governing chemicals management.

5.3.3 Ministry of Public Health and Sanitation3

The mandate of Ministry of Public Health and Sanitation is to support the attainment of the health goals of the people of Kenya by implementing priority interventions in public health. It is in charge of environmental issues contained within the Public Health Act. It enforces among others, policies on the use of chemicals in pest and vermin control. The key departments under the ministry that carry out these activities are Government Chemist Department and Public Health Laboratories.

5.3.3.1 Government Chemists Department

- The department has many statutory functions under various Acts of Parliament such as the Public Health Act, Pharmacy and Poisons Act, Food, Drugs and Chemical Substances Act, Occupational Safety and Health Act, Evidence Act.
- It provides laboratory services in the fields of public and environmental health; basically the laboratories tests substances and materials for chemical composition, compliance with legal specifications and their suitability for various uses.
- It is also charged with the function of providing scientific evidence in courts of law in order to interpret complex issues and enhance speedy dispensation of justice.
- National Public Health laboratories. Analyses of samples for compliance to public health requirements.

[1] http://www.environment.go.ke/
[2] http://www.nema.go.ke/
[3] www.publichealth.go.ke/

Tables 5.2.A, .B, .C and .D summaries the areas of responsibilities covered by these institutions.

Table 5.2 Responsibilities of Government Ministries Agencies and Other Institutions

Stages of Life cycle / Ministry or Agency	Importation	Production	Storage	Transport	Distribution/ Marketing	Use/ Handling	Disposal
Ministry of Environment and Mineral Resources							
NEMA	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Mines and Geology			**X**	**X**	**X**	**X**	**X**
Ministry of Public Health and Sanitation	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Government Chemists Department	**X**	**X**	**X**	**X**	**X**	**X**	**X**
National Public Health Laboratories			**X**			**X**	
Division of Vector Born Diseases			**X**			**X**	
National public Health Laboratories Services			**X**			**X**	
Kenya Medical Research Institute			**X**			**X**	
Ministry of Medical Services							
National Quality control Laboratories			X			X	X
Ministry of Agriculture	X	X	X	X	X	X	X
Kenya Agricultural Research Institute	X		X	X	X	X	X
Kenya Plant Health Inspectorate Services			X			X	
Pest Control Products Board	X	X	X	X	X	X	X
Directorate of Occupational Health and Safety Services	X	X	X	X	X	X	
Kenya Bureau of Standard	**X**		X	X	X		
Export Processing Zones Authority		X					
Ministry of Finance	**X**						
Ministry of Transport			**X**	**X**			
Kenya Ports Authority	X		X	X			
Kenya Air Port Authority	X		X	X			
Office of the Attorney General							
Ministry of Nairobi Metropolitan		**X**	**X**				**X**
Ministry of Local Government		**X**					**X**
Local Authorities			X			X	**X**
Ministry of Higher Education			**X**			**X**	
Universities	X		X			X	X
Intergovernmental Organisations							

Table 5.2 lists the responsibilities of various government ministries, agencies and other institutions each stage of Petroleum products life cycle

These are coordinated by the Petroleum institute of East Africa which regularly organisaes training for its stakeholders

Table 5.2 B Responsibilities of Government Ministries, Agencies and Other Institutions (Petroleum Products)

Table 5.2C Responsibilities of Government Ministries, Agencies and Other Institutions (Industrial Chemicals). The major players are coordinated under the umbrella of the Kenya association of Manufacturers. Under them are specialized committee such as those for chemicals, plastics etc

Table 5.2 B Responsibilities of Government Ministries, Agencies and Other Institutions (Petroleum Products)

Stages of Life cycle / Ministry or Agency	Importation	Production	Storage	Transport	Distribution/ Marketing	Use/ Handling	Disposal
Ministry of Environment and Mineral Resources							
NEMA	x		**X**			**X**	X
Mines and Geology		X					
Ministry of Public Health and Sanitation	X	X	X	X	X	X	
Government Chemists Department	**X**	X	X	X	X	X	
Ministry of Medical Services		**X**	**X**		**X**	**X**	
Ministry of Labor and Human Resource Development							
Directorate of Occupational Health and Safety Services						X	
Ministry of Industrialization		**X**					
Kenya Industrial Research Development Institute						**X**	
Kenya National Cleaner Production Centre		X	X			**X**	X
Kenya Revenue Authority	**X**						
Ministry of Transport				**X**			
Kenya Ports Authority			**X**	**X**			
Kenya Air Port Authority			**X**	**X**			
Ministry of Foreign Affairs							
Local Authorities			**X**				
Ministry of Energy	**X**	**X**					
National Oil Corporation of Kenya	**X**		**X**	**X**	**X**	**X**	**X**
Kenya Pipeline Corporation			**X**		**X**	**X**	
Kenya Petroleum Refineries Limited	**X**	**X**	**X**				**X**

Table 5.3 lists the responsibilities of government ministries, agencies and other Institutions for each stage of industrial chemicals (extraction ores and production processes) life cycle

Table 5.2C Responsibilities of Government Ministries, Agencies and Other Institutions (Industrial Chemicals)

Stages of Life cycle / Ministry or Agency	Importation	Production	Storage	Transport	Distribution/M	Use/ Handling	Disposal
Ministry of Environment and Mineral Resources							**X**
National Environment Management Authority	**X**	**X**	**X**	**X**		**X**	**X**
Mines and Geology			**X**			**X**	
Kenya Mateorological Department						**X**	
Ministry of Public Health and Sanitation							
Government Chemists Department	**X**	**X**	**X**	**X**	**X**	**X**	**X**
National Public Health Laboratories			X				**X**
Ministry of Medical Services						**X**	
Kenya Medical Supplies Agency			**X**			**X**	
Ministry of Agriculture							
Kenya Agricultural Research InstituteARI	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Directorate of Occupational Health and Safety Services						**X**	
Ministry of Industrialization							
Kenya Industrial Research Development Institute						**X**	
Kenya National Cleaner Production Centre						**X**	
Kenya Bureau of Standard						**X**	
Kenya Revenue Authority	**X**						
Ministry of Defence	**X**	**X**	**X**			**X**	
Ministry of Transport							
Kenya Ports Authority	**X**		**X**				
Kenya Air Port Authority	**X**		**X**			**X**	
Ministry of Justice							
Office of the Attorney General	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Ministry of Local Government							
Local Authorities	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Ministry of Higher Education							
Universities						**X**	
Ministry of Education						**X**	
Ministry of Energy						**X**	
National Oil Corporation of Kenya						**X**	
Kenya Pipeline Corporation		**X**	**X**			**X**	
Kenya Petroleum Refineries Limited	**X**	**X**	**X**			**X**	

Table 5.2D Responsibilities of Government Ministries, Agencies and Other Institutions (Consumer Chemicals)

Stages of Life cycle / Ministry or Agency	Importation	Production	Storage	Transport	Distribution/M	Use/ Handling	Disposal
Ministry of Environment and Mineral Resources							
NEMA	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Ministry of Public Health and Sanitation							
Government Chemists Department	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Kenya Medical Supplies Agency	**X**	**X**	**X**	**X**	**X**	**X**	**X**
National Quality control Laboratories						**X**	
Ministry of Labor and Human Resource Development							
Directorate of Occupational Health and Safety Services		**X**				**X**	
Kenya National Cleaner Production Centre						**X**	**X**
Kenya Bureau of Standard	**X**	**X**				**X**	
Ministry of Finance							
Kenya Revenue Authority	**X**						
Kenya Ports Authority	**X**		**X**				
Kenya Air Port Authority							
Office of the Attorney General	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Ministry of Foreign Affaires							
Ministry of Water and Irrigation			**X**	**X**	**X**	**X**	

5.4 Comments and Analysis

The MEMR has the overall responsibility for policy directions on matters relating to the environment. *It* has established a Directorate of environment at the ministry responsible for oversight role in environment policy formulation, to monitor the implementation of the policy in relation to other sectoral policies, in charge of chemical MEAs and to service the National Environment Council (NEC). To enhance effective implementation, the EMCA establishes several institutions with specific mandates and responsibilities. The NEMA is the national regulatory agency coordinating with decentralized entities at the provincial and district levels. EMCA establishes multi-sectoral technical committees, Standards and Enforcement Review Committee (SERC) and National Environment Action Plan Committee (NEAPC), to support NEMA's performance in matters of environment quality standards and environment planning, respectively. The multi-sectoral National Environment Council (NEC) is the apex national environment policy making organ.

6 CHAPTER 6: RELEVANT ACTIVITIES OF INDUSTRY, PUBLIC INTEREST GROUPS AND THE RESEARCH INSTITUTIONS

6.1 Introduction

This section describes and reviews activities of non-governmental bodies and entities which support national efforts to manage Chemicals. It discusses in brief the various programs conducted by non-governmental organizations and entities to support chemical management.

Kenya needs a serious capacity building programme from the grassroots (farm level), District level and the national level. This argument is based on the low level of awareness and information packaging and dissemination on POPs. There is increased need to use targeted electronic and print media and especially in the main local languages if the programme is to be effective. Likewise, there are a number of multilateral, bilateral agencies and regional NGOs as depicted by the Donor Coordinating Group on Environment[1] involved in various education and awareness activities. It is the duty of all industries to look into ways of striking a balance between achieving economic goals and environmental protection. This will ensure continued survival for both industries. If businesses reduce waste production and manage the rest of the waste in the best way possible, business benefits that can be expected are:

- Savings on waste collection and disposal costs, eliminating unnecessary wastage of raw materials and resources and turning former waste materials into resources.
- Extra reasons for customers to choose your products and services, through being seen as a 'green and clean' business.
- Reduces the risks and liabilities of your business through full compliance with legal requirements, licenses and standards.

While industries must report the type of waste they produce they are not obliged to disclose the amount of waste they generate, it therefore calls for good working ethics for each company to monitor how much they produce and set up reduction activities.

Many initiatives by industry to control waste include:

- Traditional pollution control, measures
- Implementation of Environmental Management Systems especially ISO14000EMS Certification
- Many now are on cleaner production programs
- Kenya has Company of the Year Awards (COYA) in which environmental performance is considered.

6.1 Activities of Industrial Organizations and Entities

Key stakeholders in pesticide use are the following:

- Agrochemical Manufacturers & Formulators (AAK);
- Fresh Producers and Exporters (FPEAK);
- Socfinaf: Independent coffee producer;
- Pesticide Importers/Stockiest/Warehouses;
- Importers of Pesticides. Under AAK
- Coffee Research Foundation

Industrial Associations Related to Pesticides includes:

- Industrial and Agrochemical Associations
- Agro-chemical Association of Kenya this association controls the agro-chemical usage in Kenya, and enforces a code of conduct among key players.
- Kenya Flower Council is an apex body in charge of all flower farmers in Kenya and especially it ensures they practice safe use of chemicals.
- Horticulture Crops Development Authority (HCDA), a parastatal responsible for horticultural development in the country on behalf of the Government.
- International Centre of Insect Physiology and Ecology (ICIPE) is among other responsibilities involved in research on alternatives to toxic chemicals.
- Fresh Produce Exporters Association of Kenya (FPEAK) represents the food horticulture growers.

6.2 Agrochemicals Association of Kenya1

The Agrochemicals Association of Kenya (AAK) is the national representative of the International Agrochem Industry represented worldwide by Crop Life International (formerly GIFAP). AAK is, therefore, the umbrella organization in Kenya for manufacturers, formulators, re-packers, importers, distributors, farmers and users of pest control products (pesticides). It promotes activities under GPA on pesticides.

6.3 Kenya Association of Manufacturers Members involved

Kenya Association of Manufacturers (KAM) has an environmental subcommittee which is in charge of reviewing regulations regarding industry on environment. The committee also participates in the formulation of environmental regulations. KAM conducts seminars to enlighten members on new and upcoming regulations aimed at helping its members understand better and give views on the regulation to enhance their levels of compliance.

However, different companies have different programmes / activities on chemical management geared towards capacity building of its staff. The Association on occasions is called upon to conduct these programs.

6.4 Printing Industry

Printing industries are major users of toxic chemicals and dyestuffs. The major printing firms are in Table 6.1. In printing industry emissions into the air consist of organic solvents and other organic solvents. Other waste include photographic and residue chemicals, metal hydroxides sludge, dye stuff and solvent residues. Table 6.1 shows the major players in the printing and publishing industry.

Table 6.1 Printing Companies in Kenya

NO	COMPANY	LOCATION
1	Lake printers & stationers ltd	Kisumu
2	Alfa Printers & Publishers Co.	Ronald Ngala St, Nairobi
3	Delux Printers Ltd.	Likoni Road . Nairobi
4	D.L. Patel Press (K) Ltd	Accra Road, Nairobi
5	Cosmic Press Ltd	Kijabe Street. Nairobi
6	Converters (EA) Ltd	Ind. Area, Nairobi
7	Paper Convectors Ltd	Nakuru
8	Majestic printing works	Nairobi

Source : Kenya Association of Manufacturers, 2005 Directory of Members

6.5 Tanning and Leather Finishing Sector

Tanning uses many chemicals which are often toxic. Tanneries also generate odorous emissions, solid waste and discharges to watercourses. The tanning sector releases toxic chemicals through incineration of solid wastes (trimmings, fleshing, chrome shavings, chrome-split waste and solids in the treatment sludge) generated from tanneries. Improved knowledge of inputs and outputs, general good management and housekeeping are possible practices to minimize emissions.

Table 7.6 shows the major tanneries and leather industries.

[1] www.agrochem.co.ke/

Table 6.3 Tanning and Leather Finishing Companies

NO	COMPANY	LOCATION
1	East African Leather Factory	Juja Rd, Nairobi
2	Nakuru Tanners Ltd	Nakuru
3	Kitale Tanners Ltd	Kitale, Trans Nzoia
4	Leather Industries of Kenya Ltd.	Thika
5	African Trade Agency Ltd	Athi River Rd, Ind. Area, Nrb
6	Sagana Tanneries Ltd.	Sagana, Kirinyaga
7	Tanneries (K) Ltd.	Athi River, Machakos
8	Bulleys Tanneries Ltd.	Ngozi Rd, Thika
10	Garissa Tanneries Ltd (Mini Leather)	Sankuri Rd, Garissa
11	Afro Leather Goods Manufacturing Ltd.	Busia Rd, Ind. Area, Nairobi
12	Bata Shoe Co. Ltd.	Limuru, Kiambu
13	Slapper Shoe Industries Ltd.	Changamwe, Mombasa
14	Kenya Shoes Company Ltd.	Uplands, Kiambu

Source : Kenya Association of Manufacturers, 2005 Directory of Members

6.6 Textile Sector

This sector leads to release of chemicals where materials containing synthetic fibres dyestuffs are used. Introduction of these hazardous wastes into the environment is mainly through solid waste products or through discharge of liquids and sludge. In textile industries occurrence of toxic chemicals is due to use of chlorinated chemicals, especially pentachlorophenol to protect raw materials such as wool, cottonne and other fibers; use of dioxin contaminated dyestuffs. Table7.7 shows the major textile factories.

Table 6.2 Textile Factories/companies

NO	COMPANY	LOCATION
1	African Cottonne Industries	Taveta Road, Mombasa
2	Kenya Textile Mills	Factory St., Ind. Area, NRB
3	Londra Ltd.	Lower factory St, Nakuru
4	Rift Valley Textiles Ltd.	Eldoret, Uasin Gishu
5	Kenwool Enterprises Ltd.	Koinange St., Nairobi
6	Kenya Rayon Mills Ltd.	Mombasa
7	Blanket industries ltd	Mombasa
8	Ken Knit (K) Ltd.	Eldoret, Uasin Gishu
9	Mt. Kenya Manufacturers Ltd.	Nyeri
10	Thika Cloth Mills Ltd.	Thika
11	Kisumu Blanket Manufacturers	Busia Rd., Kisumu
12	Spin knit ltd	Nakuru
13	Megaspin Ltd	Nakuru

Source: Kenya Association of Manufacturers, 2005 Directory of Members

6.7 Battery industry

Batteries contain heavy metals such as mercury, lead, cadmium, and nickel, which react with chemical electrolyte to produce the battery's power. These heavy metals can contaminate the environment when batteries are improperly disposed of.

6.7.1 Battery Recycling: Lead-Acid Automobile Batteries

All lead-acid batteries can be recycled. People who recycle crush batteries into nickel-sized pieces and separate the plastic components. They send the plastic to a reprocess or for manufacture into new plastic products and deliver purified lead to battery manufacturers and other industries. A typical lead-acid battery contains 60 to 80 percent recycled lead and plastic. Recycled batteries keep heavy metals out of landfills and the air. Recycling

saves resources because recovered plastic and metals can be used to make new batteries. However, Kenya is currently experiencing shortages of recyclable lead due to high demand of the same by China's automobile industry. Consequently on 25th May, 2007 the major factory associated battery Manufacturers could not raise enough scrap batteries and closed operations. In addition, 30,000 – 40,000 wet-cell lead-acid batteries are manufactured in Kenya each month or 360,000 – 480,000 per year by five major battery manufactures.

Wet-cell batteries, which contain a liquid electrolyte, commonly, power automobiles, boats, or motorcycles. Some kind of rechargeable batteries which are n be recycled include nickel-cadmium (Ni-CD), nickel metal hydride, lithium ion, and small-sealed lead. A charge up to recycle program offers various recycling plans for communities, retailer, businesses, and public agencies.

6.8 Plastics

There are about 100 manufacturers of plastic products in the country. The products are locally marketed and exported to the COMESA sub region. Almost all the raw materials are imported. There are also 20 plants recycling plastic wastes. Most are based in Nairobi. These manufacture a total of 192,836 t/yr of plastics from a raw material input of 239,602 t/yr.

Out of the manufactured total, 49,022 t/yr (25%) comprises of plastic carrier bags. 27,813 t/yr of finished plastic products are imported. Of the total plastic carrier bag produced, about 50% (24, 511 t/yr) are less than 15 micron thickness and are primarily used for carrying consumer products are difficult to recycle[1] and are responsible for most pollution and often find themselves in the environment. They have now been banned by the city council of Nairobi through a bylaw.

Total plastic consumption in Nairobi is 211,316 t/yr, taking into account imported plastic products (27813 t/yr), Nairobi based production (192,836t/yr) and less exports (9,333 t/yr). Out of this total plastic consumption (211,316 t/yr). 38,516 t/yr are retained and reused while (172,800t/yr) are classified as waste. Only 1,728 t/yr of the above waste is recycled with the remaining bulk (171, 072 t/yr) being dumped into the environment. The major manufacturers of plastics are shown on

6.9 Pharmaceuticals

Kenya has about 30 pharmaceutical manufacturers producing a wide range of medical and sanitary products[2]. Over 95 percent of raw materials inputs are imported. The industry has in the past years grown rapidly, and diversified in product manufacture to become one of the largest in the COMESA sub region. For all the pharmaceutical products made locally, the industry is able to meet the local demand and export to non-COMESA countries.

Most pharmaceuticals usually contain many organic solvents and residue, heavy metals (mercury and zinc for example). Most pharmaceutical companies are of medium scale.

[1] The UNEP.ROA/NEMA project on sustainable management of Plastic waste has developed a 10-point plan to manage the plastic waste. The Minister for Finance in his June 2007 Budget Speech slapped a heavy duty on Plastic flimsy papers. In line with this the CCN has developed tough laws on carrying plastic paper in the City of Nairobi.

[2] Kenya Association of Manufacturers. Directory, 2005

Table 6.4 Plastic Manufacturing and Recycling Enterprises companies

	Company	LOCATION	LOCATION
1	Devani (plastic) R.H. Ltd	Nairobi	Kitui Rd., Industrial Area, Nrb
2	PolyFabs Ltd	Mombasa	Mombasa
3	Acme Containers	Mombasa	Msa/ Nrb Rd.
4	Afro Plastics Ltd	Nairobi	Ind. Area
5	Allied Association Ltd	Nairobi	Dakar Rd.
6	Cables & Plastics Ltd	Mombasa	Port Reitz Rd
7	Kenpoly Manufacturers Ltd	Nairobi	Lunga Lunga Rd.,Ind. Area, Nrb
8	Kenya Plastics Industries	Kisumu	Nkuruma Rd., Kisumu
9	Kentainers	Nairobi	Nairobi
10	NAV Plastics Ltd.	Thika	Off Garissa Rd., Thika
11	Kenya Laminate(1975) Ltd.	Nairobi	Nanyuki Rd, Ind. Area
12	Pan Plastics Ltd	Nairobi	Ruaraka
13	Uni Plastics Ltd	Nairobi	Nairobi
14	Coast Plastic Ltd.	Mombasa	Mombasa
15	Plastics Products Co. Ltd	Nairobi	Ind. Area
16	E.A Packaging Industries ltd	Nairobi	Ind. Area
17	EMCO Plastic (Inter) Ltd	Mombasa	Chai St. Mombasa
18	Euro Plastic	Nairobi	Kirinyaga Rd
19	Classons Plastic Ltd	Nairobi	Lunga Lunga Rd, Ind. Area
20	Elson Plastics (K) Ltd.	Nairobi	Enterprise Rd, Ind. Area
21	Plastic & Rubber Ltd.	Nairobi	Gilgil Rd, Ind. Area,
22	Tee Gee Electrics & Plastics Co. Ltd	Vihiga	Water Supply Rd, Tiriki, Vihiga
23	Textile & Plastic Industries Ltd	Mombasa	Mombasa
24	Nairobi plastics ltd	Nairobi	Nairobi
25	Cosmo Plastic Ltd.	Nairobi	Homa Bay Rd, Ind. Area,
26	King Plastics industries ltd	Nairobi	Nairobi
27	Edaflam Plastics Ltd	Nairobi	Ind. Area.
28	General Plastics Ltd	Nairobi	Enterprise Rd, Ind. Area, Nrb
29	Mepal Plastics (K) Ltd	Nairobi	Lunga Lunga, Ind. Area, Nrb
30	Flora Plastics Industries	Nairobi	Rimba Rd, Msa
31	Sera Coatings Ltd	Nairobi	Lusengeti Rd, Ind. Area, Nrb

Source: Kenya Association of Manufacturers, 2005 Directory of Members

6.10 Activities/Programs of Non-governmental Organizations

6.10.1 Kenya National Cleaner Production Centre

The Kenya National Cleaner Production Centre (KNCPC) was established by the UNIDO, UNDP and UNEP in July, 2000. The centre plays a key role in promoting the goals of sustainable development in both service and manufacturing industries. Some of the activities that are in line with sound chemicals management carried out by the Centre are;

- Resource Efficiency & Cleaner Production (RECP); this is a six month to one year program that monitors resource use in industries. Within this program, chemicals are assessed as a resource and all environmentally sound technologies (EST) are monitored for improvements and corrective measures.

- Environmental Impacts/audits assessment to monitor the state of environment on products, services and processes. In all these activities environmental parameters e.g. Chemical Oxygen

Demand and Biological Oxygen Demand are monitored and reported to NEMA for continual improvements.

- KNCPC participates in policy advisory e.g. development of Waste Management Regulations of 2006 incorporated in Environmental Management and Coordination Act, 1999.

- KNCPC in partnership with UNIDO and other NCPC's are currently in progress of implementing chemical leasing and substitution this will ensure sound chemicals management where services are provided by chemical industries rather than sale of chemical goods (barrels).

- The Cleaner Enterprise Programme entails the capacity building aspect, the Centre provides in-house, hands-on training on chemicals management throughout the entire life cycle of chemicals. The Centre also successfully developed a Voluntary Environmental Code of conduct for businesses around the Lake Victoria basin; this includes a guide on sound management of resources by businesses around the lake basin.

Cleaner Production Award; this is a function held annually, every 20th, Nov deliberately to coincide with the Africa Industrialization Day. During this ceremony, industries that have successfully cut down on pollution are awarded. This award covers Occupational Health and Safety, Gaseous emission reduction award which covers all Volatile Organic Compounds (VOC's), dioxins and furans, green house gas (GHG) emission among others. In this way, industries are encouraged to manage chemicals soundly.

There are a number of public interest organizations which promote sound management of chemicals in Kenya. These include the non-governmental organizations and other consumer labor organizations**.** They include Pan African Chemical Network, iLima, Eco ethics, Envilead, Kenya National Cleaner Production Center

6.10.2 Trade Unions

Workers and trade unions play a major role in the achievement of sustainable development through involvement in industry, protection of the working environment and promotion of socially responsible and economic development. Through their networks and extensive membership, trade unions provide important channels for supporting concepts and practices of sustainable development. The key trade Union in Kenya is the chemicals and allied workers Union under the central Organization of Trade Unions (COTU)

Their roles include:

- Promoting the rights of individual workers to freedom of association;
- Promoting the active participation of workers in decisions on the design, implementation and evaluation of national and international policies and programmes on environment and development, including employment policies, industrial strategies, labor adjustment programmes and technology transfers;
- Ensuring that workers and their representatives are provided with all relevant information to enable effective participation in these decision-making processes;
- Establishing the framework for a joint environmental policy, and set priorities to improve the working environment and the overall environmental performance of enterprise;
- Seeking to ensure that workers are able to participate in environmental audits at the workplace and in environmental impact assessments;
- Promoting access to adequate training to augment environmental awareness, ensure their safety and health, and improve their economic and social welfare. Such training should ensure that the necessary skills are available to promote sustainable livelihoods and improve the working environment.

Environment Health and safety committees (EHS) are supposed to enforce and create awareness.

6.10.3 Federation of Kenya Employers1

The Federation of Kenya Employers (FKE) is the leading employers' organization in advocacy, industrial relations, employment laws and related value-add services through management consultancy and training. The Federation's objectives may be summarized as follows:

- To act as a consultative forum amongst employers
- To advocate, promote and defend Kenyan employers on matters relating to their interests
- To encourage the principle of sound industrial relations and observance of fair labour practices
- To promote sound management practices amongst employers through training, research and consultancy services and adoption of best practices
- To network with other employers and business organizations on matters of concern to employers

  So far FKE in cooperation with UNIDO/WHO have carried out programs with major industries that use large quantities of chemicals such s HACO, Chandaria Industries etc.

6.10.4 Central Organization of Trade Unions

Central Organization of Trade Unions (COTU) seeks to promote the social, economic, political and other interests of the Kenyan workers". It is an Umbrella organization of several workers unions some of whose members are working with chemicals in manufacturing sector or use.

6.10.5 Kenya Plantation and Agricultural Workers Union

The Kenya Plantation and Agricultural Workers Union (KPAWU) is a trade union which represents 200,000 agriculture sector workers in Kenya, including tea, coffee, and flower workers. The KPAWU was established in 1963 when several unions were amalgamated. KPAWU has been representing workers in horticultural industry and especially the flower industry.

6.11 Nongovernmental Organizations

6.11.1 iLima

iLima is a non-governmental organization established in the year 2004 and specializing in promoting a toxics-free future and sustainable development approaches. 'iLima' is a word of South African origin meaning '*collective action*'. Since inception, iLima programs and projects have been focusing on awareness creation, capacity building of communities and civil societies on chemical safety. The following are some of the programs and projects. iLima has carried out projects within key component areas of the National Implementation Plan to achieve implementation of the convention in Kenya The main aim of these projects has been to:

- Raise awareness on the Stockholm Convention and possible sources of POPs and their effects on Health and Environment.
- Carry out education and capacity building on the convention and application of the BATs and BEPs such as Zero waste program as an alternative to practices that produces POPs.
- Carry out studies and inventories on sources and amount of POPs released into the environment.
- Establish national and regional NGO coordination and capacity in all regions of the world in support of longer-term efforts to achieve chemical safety.
- Promote public participation in the implementation of the convention through organizing skills-sharing on how NGOs and relevant stakeholders from across the country can utilize and reference the Stockholm Convention in their work.
- Demonstrate applicable best available technologies and environmental practices to minimize production of POPs.

[1] www.fke-kenya.org/

iLima has also carried out projects that were geared towards implementation of SAICM in Kenya. Their main aim was:

- Raising awareness on chemical safety at the grass root level in Kenya.
- Education and capacity building of local communities, NGOs, civil societies among others on chemical safety and environmental sustainability.
- Mobilizing other NGOs and interest groups to participate in the Global NGO SAICM Outreach Campaign, which is an inter-NGO-network campaign to reach out to new NGO groups and raise awareness about SAICM.
- Promoting translation of specific information, awareness campaign materials, news/updates and ongoing or emerging issues on chemicals, in order to overcome language obstacles and make information at the global level available at the local and national levels.
- Promoting implementation of the Globally Harmonized System for classification and Handling of chemicals in Kenya.

Heavy metals including mercury, lead and cadmium are of concern to many countries due to their toxic nature. Mercury is present in consumer products, health care, and artisanal and small-scale gold mining among others, Lead is present in paints, toys among other products. Cadmium is also very toxic and finds use in many commercial applications, including electroplating and manufacture of batteries.

iLima in collaboration with other partners, has carried out the following activities in dealing with challenges posed by these metals:

- Studies on the levels of heavy metals in products (i.e. lead in paints and toys, mercury in laboratory and electrical/electronic equipment).
- Studies on the extent and ways mercury is used in mining activities and the associated impacts.
- National awareness campaigns on heavy metals and containing equipment use, handling and disposal e.g. Mercury in skin lightning products (cosmetics) targeting women.

6.11.2 Eco-Ethics International Union Kenya

Eco-Ethics International Union Kenya (EEIU-Kenya) is a non-governmental organization founded under Eco -Ethics International Union (EEIU) a Germany based organization with its head offices in Oldendorf/Luhe, Germany. Based at the Coast of Kenya, EEIU- Kenya commenced its operations as registered non-governmental organization (NGO) on the 16th of September, 2002.

Eco-Ethics aims at having a world of human communities that value and are adequately informed about their actions to the natural environment. The organization's main activity on sound chemicals management is Eco-Ethics is presently implementing a project that seeks to educate the public, civil society organizations, private sector institutions and government agencies on POPs, supporting informal sector artisans to initiate and develop alternatives to open burning of plastics and car tires, influencing car tire manufacturers to buy back used tires from the artisans and influencing the Mombasa Municipal Council to improve its by-laws on solid waste disposal to discourage open burning of wastes and establish a stronger civil society organizations network to campaign and advocate for proper chemicals management.

6.11.3 Consumer Information Network

The Consumer Information Network (CIN) is a leading consumer organisation in Africa which has developed a sound expertise in the areas of the environment, food safety, health and trade. It is an autonneomous, non-profit making, non-sectarian and non-political national consumer organization founded in Nairobi in 1994 with three regional offices.

Today, CIN represents consumers in a number of decision and policy making boards including: at the product standards specification technical committees at the KEBS (Kenya Bureau of Standards), trade policy review with the National Committee on World Trade Organization [NCWTO], health and environment committees/boards. CIN has been actively involved in the development of the Biosafety Bill in Kenya and is a partner in the ongoing multi-country EC-funded project called 'Consumer Organizations and the Cartagena Protocol on Biosafety: Protecting the Consumer's Right to a Healthy Environment in the Developing World'.

6.12 Activities of Universities and Research Institutes

Research on chemicals in the country is mainly conducted by the national research institutions Universities and other tertiary institutions. All public universities in the country have chemistry departments that spearhead the training and research on chemical management. The research activities are diverse ranging covering the entire spectrum of chemical education, ranging from environmental risk assessment to synthesis.

6.12.1 University of Nairobi Chemistry Department

The Department of Chemistry, University of Nairobi is the oldest chemistry department within the public universities. Like many of the other departments, it undertakes research on diverse aspects of chemicals including fate and transport of pesticide residue analysis in environmental samples covering including degradation, mineralization, photodecomposition, volatilization, transport in soils and toxicological effects using Micro-Ecosystem Models. It also carries out assessment of the environmental levels of POPs in air, water, sediments and biota. For instance in 2008, the Department conducted sampling and analysis of POPs in ambient air in Kenya with the collaboration of RECETOX in Czech Republic. The department also conducts research on assessment of toxic heavy metals such as mercury, lead, cadmium, zinc, manganese, and copper in environment among others. The University of Nairobi Department of Public Health and Pharmacology has undertaken research on DDT and metabolites in human breast milk. In 2009, the institution carried out human breast milk sampling for analysis of POPs in collaboration with WHO.

Other Universities that carry out research on chemicals include Jomo Kenyatta University of Agriculture and Technology, Moi University, Masinde Muliro University and Egertonne University (Entomology departments). Each has training at Bachelors, Masters and Doctorate levels.
The Pan Africa Chemistry Network is networking scientists, researchers, schools and libraries, to help promote science and research throughout Africa. The Network aims to support the teaching of chemistry, support chemistry in Higher Education, promoting intra Africa scientific networking, and establish centres of excellence for the chemical sciences.

6.13 Research Institutes

The main national research institutions that address chemical issues include Kenya Medical Research Institute (KEMRI), Kenya Agricultural Research Institute (KARI), and Kenya Industrial Research Development Institute (KIRDI). These perform focused research to support the activities of the parent ministries. Non-governmental institutes that are involved in research include International Center for Insect Physiology and Ecology (ICIPE) and ILRAD.

6.13.1 Kenya Medical Research Institute

Kenya Medical Research Institute (KEMRI) conducts research on effects of pesticides among formulators/store-men and farm workers. It also has pesticide inventories for the work carried out in 1990's(Mbakaya, 1994). Other research activities at KEMRI include effectiveness of malaria vector control such as bed nets, larviciding, Insecticide Residual Spraying (IRS), and other insecticides of

public health importance. KEMRI is working with Pyrethrum Board of Kenya to evaluate the quality of their products for vector control as an alternative to the use of environmentally toxic chemicals as called for by SAICM

6.13.2 The Kenya Agricultural Research Institute

The Kenya Agricultural Research Institute (KARI) deals specifically with efficacy trials of Agricultural pesticides for field and stored crops and fertilizers. In general, research activities in the country are targeted to specific needs of the society. However, there are limitations of funding, technical equipment and adequate human capacity as well as lack of information and networking/collaboration amongst above institutions.

6.13.3 International Centre for Insect Physiology and Ecology

International Center for Insect Physiology and Ecology (ICIPE) is an organization with a tropical agenda. Insects pose a greater risk to food production, often causing the loss of entire crops and destroying about half of all harvested food in storage. Established in Kenya in 1970, *ICIPE's* founders recognized that the mainly developing countries in the tropics had special problems that were not being adequately addressed by scientists and organizations in the North. It should come to no surprise therefore that *ICIPE's* objectives for this millennium are essentially the same as they were three decades ago namely:

- To help ensure food security and better health for humankind and its livestock;
- Searching alternatives to toxic chemicals and
- To protect the environment by promoting environmentally sound best practices

Initiatives

Many initiatives by industry to control waste include:

- Traditional pollution control, measures
- Implementation of Environmental Management Systems especially ISO14000EMS Certification
- Many now are on cleaner production programs
- Kenya has Company of the Year Awards (COYA) in which environmental performance is considered.
- Initiatives for cleaner production were started in 1998 by MEMR/UNIDO/FKE/WHO for food sector and were successful as people could identify business opportunities, cost savings and compliance with national legislation
- The Kenya National Cleaner Production Centre was started in 2000 by the Kenya Industrial Research and Development Institute;
- Typically 2 months are spent in identifying cleaner production opportunities
- 4 months are allocated for implementation
- By December 2003, a total of 22 companies had completed waste minimization projects.
- of possible waste materials estimated at 300MT

.

Table 6.5 Activities of Industry and Interest Groups

Field of Expertise	Research Institutes	Universities	Industry	Environmental/ Consumer groups	Labor Unions	Professional Organizations	Others IOMC members
Data Collection	KEMRI, KIRDI, KARI, ILRI, ICIPE	**Pub;ic niversities**	KAM AAK KNCCI	KNCPC, iLima PSR- Kenya	COTU	KNBS KEBS	WHO FAO ILO UNEP
Testing of Chemicals	KIRDI KEPHIS KEBS	**Pub;ic Universities**	SGS LABS KEBS	Kenya Consumer Organisation	-	System Generalle -	Public hospitals Private sector
Risk Assessment	KEMRI, KIRDI, KARI, ILRI, ICIPE,	**Pub;ic Universities**	Kenya Insurance association	KNCPC, NGO'S CBO'S	FKE	Kenya Safety Surveyors	WHO FAO ILO UNEP
Risk Reduction	KEMRI, KIRDI, KARI,	**Pub;ic Universities**	Kenya Safety Surveyors	KNCPC, NGO'S CBO'S	FKE	Insurance Agencies	WHO FAO ILO UNEP
Policy Analysis	KIPRA KIERA	**Pub;ic Universities**	KAM	KNCPC, NGO'S CBO'S	COTU	None	WHO FAO ILO UNEP
Training and Education	KEMRI KIRDI KARI	**Pub;ic Universities**	KNCPC	KNCPC, iLima, Eco-ethics, PSR - Kenya			WHO FAO ILO UNEP
Research on lternatives	KEMRI KARI KEFRI	**Pub;ic Universities**	KIRDI				WHO UNEP
Monitoring	KARI	**Pub;ic Universities**	Water Quality Laboratory	AAK		AAK	FAO UNEP
Information to workers	DOHSS KEMRI	**PubicUniversities**		KNCPC, iLima, Eco – Ethics, CBO'S	COTU		WHO FAO ILO
Information to public	**Pub;ic Universities**	**Pubic Universities**	Print/ Electronic media	KNCPC, PSR – Kenya, CIN, iLima, Media Houses			WHO FAO ILO UNEP

Table 6.A Institutions involved in Chemical management in Kenya

6.14 Comments and Analysis

There is an ever increasing but very low level of waste management consciousness in Kenya society, understanding that waste needs to be collected and disposed in an environmentally safe way, and that recovery of reusable matter and methodology of disposal (Incinerator to generate electricity) can pay for much of the service.

- Waste education needs to be conducted to encourage and enable producers to sort it at source to facilitate recovery of recyclable items according to the needs of the buyers.
- Waste is no longer mainly natural product and easily biodegradable. A lot of man-made content which should not only not be dumped but recycled or in the last resort incinerated to destroy the non-degradable/non-reusable (preferably burnt to produce power) which is now a large part of both residential and industrial waste.
- Lack of proper incinerators to deal with this kind of waste leads to this waste finding its way to the dumpsite with dire consequences to the water table, the environment and neighboring residents.

Achieving commercial success in ways that honor ethical values, compliance with legal requirements and respect for people, communities and the natural environment

7 CHAPTER 7: INTERMINISTERIAL COMMISSIONS AND CO-COORDINATING MECHANISMS

7.1 Background

A key component of SAICM is the establishment of an inter-ministerial co-ordination mechanism. The objective of the inter-ministerial co-ordination mechanism is to ensure coordination of all national activities concerned with chemicals and hazardous waste management. For this purpose the UNITAR and the Inter-organization Programme for the Sound Management of Chemicals (IOMC) have developed a Guidance Note[1] to be used in formulating the terms of reference for the establishment of an inter-ministerial coordination mechanism. This is because chemicals management encompasses a broad range of risks and issues, each of which may be addressed by any number of Government ministries, agencies or units, as well as parties outside of government. In order to achieve more integrated national approach to chemicals management, a coordinating mechanism is desirable through which the various actors can exchange information, coordinate activities that are complimentary or inter-related and, in certain instances, make joint decisions or, in the longer term, develop national policy.So far the mechanisms have been adhoc, specific and time bound. A well organized inter-ministerial coordination mechanism can help to increase transparency and collaboration among ministries, clarify the respective mandates and competencies of the various agencies, facilitate the sharing of information and resources, and foster a comprehensive approach to the management of chemicals.

Under current laws and administrative practices, there are several mechanisms that deal with inter-ministerial coordination. among those ministries and departments with a mandate for chemicals management. These mechanisms potentially, provide for inter-ministerial coordination on matters relating to chemicals management. The key mechanisms and institutional arrangements are reviewed below.

Table 7.1 Overview of Inter-ministerial Commissions and Co-coordinating Mechanisms

	Name of Mechanism	Responsibilities	Secretariat	Members	Legislative mandate/ objective
1.	Pesticide management	All matters pertaining	PCPB	MOST KEBS FMOA	PCP ACT CAP 346
2.	National Environment Council	Policy formulation	NEMA	Ministries Universities, private sector	EMCA 1999
3.	Standards Enforcement& Review Committee	Standardsand Regulations Formulation and Review	NEMA	All ministries	EMCA 1999
4.	Provincial Environment Committees	Coordinating at provincial level	NEMA	Third schedule	EMCA 1999
5.	District Environment Committees	Coordinating environmental issues at District level	NEMA	Third schedule	EMCA 1999
6.	National advisory committee on	Ensuring worker safety	DOHSS	COTU FKE NCST	OSHA7
8.	Local Authority Environment Management Committees	Coordinates within the local authorities	Local Authority	Technical departments	Cap 265

Key: 1. Very Effective, 2 Effective, 3.Moderately effective, 4. Just effective

[1] UNITAR/IOMC, *Inter-ministerial Coordination for Sound Chemicals Management - Guidance Note*, Working Draft, July 2001.

7.2 Description of Inter-ministerial Commissions and Co-coordinating Mechanism

7.2.1 National Environmental Council (NEC)

National Environmental Council (NEC) is a standing committee established under the Environmental management and Coordination Act, 1999. The NEC is responsible for policy formulation and directs implementation of the Act. It sets goals and objectives and determines policies and priorities for the protection of the environment. It also promotes cooperation among public institutions, Non-governmental Organisations, private sector and Inter-governmental Organisations. The council meets at least four times in every financial year. The council meetings are chaired by the Minister for Environment while the PS is the secretary.

7.2.2 Provincial Environment Committees (PECs) & District Environment Committees (DECs)

The Provincial Environment Committees are appointed by the Minister for Environment. The membership comprises government institutions, representatives of farmers, pastoralists, business community, NGOs, Regional development Authorities. They are responsible for proper management of environmental issues within their provinces. The PEC meetings are dependent on the current issue. Their decisions are then transmitted to the headquarters for further guidance. These committee direct actions at the district and local levels.

7.2.3 Pesticide Management Committee

The Pesticide Management Committee is established under the Agriculture Act. The committee coordinates registration of agricultural chemicals. Its meetings are held at least four times in a financial year. The committee membership comprises relevant government departments and the private sector. It regulates both agricultural and public health pesticides, with the main focus on the former.

7.2.4 Standards Enforcement and Review Committee (SERC)

The SERC is established under EMCA, 1999. The SERC is responsible for formulation of standards, regulations and guidelines. The SERC is comprised of members listed under the third schedule of EMCA, 1999. The Chair is the PS- Environment and the secretary is a director from the Authority. The SERC meetings are supposed to be held at least once in three months. It is responsible for making regulations on toxic and hazardous materials i.e. industrial chemicals. The Authority is both inadequately funded for efficient formulation of standards, regulations, and guidelines. It sets system guidelines and guidance as well as reviewing emission standards.

7.2.5 National Advisory Committee on Occupational Health & Safety

The NACOHS is established under the Occupational Health & Safety Act, 2007 and its membership comprises representatives from relevant government departments, trade unions, employer associations, among others. The committee guides on issues of safe handling of chemicals and protection of their health impacts. It coordinates establishment of health and safety committees in the work places. The committee has incorporated responsibility of employee on the usage of personal protective equipment where provided, in the new Occupational Health & Safety Act, 2007. The decisions made are implemented by the DOHSS. They set by-laws and guidelines for pesticides and industries.

7.2.6 Local Authority Environment Management Committees

The Local Authority Environment Management Committees (LAEMCs) are established under the local authorities. These committees are responsible for management of all issues impacting on the environment. They act as the link between various departments of the local authorities which have different mandates. They fill the gaps that arise during sectoral implementation of the various mandates in management of the environmental impacts. Key ones are The City Council of Nairobi, The City Council of Mombasa and The City Council of Kisumu.

7.3 Description of Mechanism for Obtaining Input from Non-Governmental Bodies

Often government institutions include the non-governmental organisations in the programs especially project steering committees for implementation of projects as well as in taskforces on formulation of standards, regulations and guidelines. The NGOs play a critical role in awareness raising on chemical issues at the community level and relevant government institutions attend fora organized by them in this regard. The NGOs also forward workshop reports to the relevant departments for implementation of the recommendations made. Few NGOs are involved in chemical issues at the community but interest is growing.

The following non governmental bodies are involved in chemical management at all stages:-

a) Research Institutions
b) Universities
c) Central Organization of Trade Unions;
d) Federation Kenya Employers
e) Kenya National Chamber of Commerce and Industry
f) Kenya Association Of Manufacturers
g) Chemical and Allied Workers Union
h) Consumer Information Network
i) Association of Agrochemicals of Kenya
j) Kenya Flower Council
k) Fresh Produce Exporters Association of Kenya
l) Kenya Planters and Flower Workers Union
m) Green Belt Movement
n) Ilima
o) Physicians for Social Responsibility
p) Refrigeration Technicians Association.
q) Examples of Interministerial Commissions
r) The Kargi Interministerial Commission

7.3.1 Task Force Allegations of cancer from toxic waste in North eastern Province

For the last 10 years, there have been persistent complaints and allegations of episodes of sickness and death of livestock and people as well as increased cancer cases in North Eastern and Eastern Provinces. The cancer has wreaked havoc on the people of the vast Chalbi Desert, Kargi, Maikona and surrounding areas. Kargi Location in Laisamis District is allegedly the worst affected. Others being Maikona, Kalacha, North Horr, Bubisa and Dukana. Causes were identified in water and possibility that chemicals were dumped when oil well explorations was going on in early 80s. In response to this, the Permanent Secretary Ministry of Environment and Mineral Resources set up an interministerial taskforce in April 2009 to address the issue. This taskforce has met several times. Agreeing that it was urgent to set up a roadmap for resolving the issue by identifying the cause. Interministerial coordination from relevant key ministries.

Interministerial coordination from relevant key ministries and institutions as follows:

i. Ministry of Environment and Mineral Resources Headquarters (chair) and Geology Departments

ii. Ministry of Water and Irrigation
iii. Ministry of Public Health and Sanitation – Government Chemist
iv. Ministry of Medical Services
v. Departments of Veterinary Services
vi. University of Nairobi – Chemistry Department
vii. National Oil Corporation

The taskforce undertook the following:-

i. Reviewed water quality data from the region and especially the greater Marsabit District
ii. Reviewed reports of incidences of poisoning of animals and plants over time focusing on causes and impacts(effects)
iii. Reviewed past reports on water quality, animal deaths and medical cases.
iv. Identified areas of common complaints
v. Visited the Kargi, Marsabit and Laisamis.
vi. Samples and analyzed the water samples

It is reported that every month, at least one person dies in Marsabit, District (Laisamis, Chalbi, Marsabit) sometimes two. And they are not killed by the cattle rustlers the area is notorious for. They die of cancer and that the deaths are increasingly becoming more of a menace. The cancer reportedly has wreaked havoc on the people of the vast Chalbi desert and surrounding areas. he people are mainly pastoralists keep sheep, goats and camels. Kargi Location in Laisamis District is the worst affected. Others are Maikona, Kalacha, North Horr, Bubisa and Dukana in Chalbi District. "We get cases of at least two to three patients from Marsabit every week, who are referred to this hospital for biopsy (further examination). And when they are diagnosed, some but not all, suffer from cancer," said the medical officer of health at Meru's Chogoria Mission Hospital, a Dr Odongo. Most of these patients are later referred to Kenyatta National Hospital but the majority prefers to go back home and wait to die.

In the absence of official figures of those who have died of cancer, Kargi Dispensary, run by Marsabit Catholic diocese, has kept the records. Records from the only health centre in Kargi Location show that 38 people have died of the disease since 2006. Eleven of them died in 2008 and a similar number in 2006. In 2007 the number was 12. N 2007, four people had died by June 30, while two others were bedridden at home. These patients first come to the dispensary having the same symptoms and are referred to Marsabit district hospital. Some are later referred to other health facilities. The symptoms include difficulty in swallowing meat, the area's staple as they can only take milk; they say a wound develops in the throat. Most of the victims are men and women over 40 years. Out of the 38 who died, there were a few cases of breast cancer.

The desert has no piped water and people rely on boreholes and shallow wells. They say they have seen herds of livestock dying after consuming the water. Twice, hundreds of livestock have died after taking the water. The first was in the early 1990s, when a flock of sheep and goats died in Balesa, near Dukana.

"They had taken water from a borehole that had just been drilled next to an abandoned well. The well had been dug by an oil exploration company," recalled Mr Ali Adano, a community elder in Dukana. The second case occurred in 2002 in Kargi Location. More than 7,000 sheep and goats died after drinking water from a borehole. Like in Balesa, the borehole had been drilled next to a oil well dug by Amoco Kenya Ltd, in the 1980s. Amoco is a multinational corporation based in the United States. Some locals claim the company discharged nuclear waste in the desert before halting its project. There are others who suspect relief food supplies to be the cause of the cancer while some point at tobacco and khat (miraa), chewed by a big number of people in the area.

7.4 Comments /Analysis

The present coordinating mechanisms have attained various levels of effectiveness but are not formal in many instances. However, in cases where regulatory mechanismes are in place, they tend to be effective e.g. the Pesticide Management Committee is very effective since there is a working regulatory regime in place. The NEC, PEC, DEC, SERC all under EMCA, 1999 have each various levels of effectiveness. For instance the SERC is currently formulating a regulation on industrial chemicals for adoption in a national stakeholders' forum. The NACOHS is quite effective in monitoring the work place environment. To improve their effectiveness there is need for identification of environment desk officers in each department for ease of horizontal communication, establishment of network of environment desk officers for ease communication and formation of thematic adhoc groups which can meet more frequently to address chemical issues. These desk officers could be trained to be re-oriented with focus to the chemical risk as detailed in SAICN Declaration on the overarching policy strategy and global plan of action. The composition of these mechanisms includes government departments and agencies, to cover the whole life cycle of chemicals to different levels of success. Additional mechanisms include an over-arching mechanism into which partners would report to and the information would be disseminated to other sectoral mechanisms. This mechanism is being developed. The institutions generally work sectoraly although membership may include the same officers due to inadequate staff. There are situations whereby NGOs are included in these mechanisms.

8 CHAPTER 8: DATA ACCESS AND USE

8.1 Availability of data for National Chemical Management

Expertise is sought from the public and foreign experts. It is noted that information sharing is rarely practiced, hence the need for improved networking between institutions to avoid duplication and promote synergy. The adhoc interministerial committee meetings for preparation of national position papers or country reports to international meetings act as fora for sharing information, but these are on adhoc basis. Past committees include SAICM steering committee; National Ozone Depleting Substances (NACODS) committee; National POPs Committee and the The Climate Change Committee

They are strong in the following:

- Promotion of sound management programs for chemicals and waste in their own organizations.
- Knowledge on the linkage of Trade and Environment
- Presence of a multi-sectoral/ multi-stakeholder mechanism to develop National Plans & priority actions.
- Knowledge on the focal points for the various chemicals and waste conventions.

More work needs to be done in the following:

- Close working with other sectors in Government in promoting sound chemicals and waste management.
- Knowledge of **"**corporate environment & social responsibility**"** concept
- Improvement on the part of the corporate body on its public image and perception
- Involvement of these institutions in setting up policies.
- Involvement of women in decision making processes.

Governments and relevant international organizations with the cooperation of industry should:

- Assist in the creation of national chemical information systems in developing countries and improve access to existing international systems;
- Improve databases and information systems on toxic chemicals, such as emission inventory programmes, through provision of training in the use of those systems as well as software, hardware and other facilities;
- Provide knowledge and information on severely restricted or banned chemicals to importing countries to enable them to judge and take decisions on whether to import, and how to handle, those chemicals and establish joint responsibilities in trade of chemicals between importing and exporting countries;
- Formal and non formal education is important in order to increase awareness, improve extension services, sensitize people on chemical issues and build institutional capacities. Kenya continues to include chemical risks management into the curriculum of formal education. Non-formal education benefits people outside the formal education system. Communication of chemical information to stakeholders remains wanting. .

8.2 Releasing Chemical data

- The key indicators relevant to knowledge and information are; Standards/regulations in for labeling the hazards and/or risks posed by chemicals at the stages of production, occupational use, consumer/public use, transport and disposal. This information is available and routinely applied though in an adhoc manner. The Kenya Government has not conducted assessment of the conformity of labeling requirements with those of the Globally Harmonized System for the Classification and Labeling of Chemicals (the "GHS") for dangerous Goods, pesticides, consumer products, occupational health and safety/Workplace use and industrial chemicals as required by the international requirements on GHS.
- Kenya has undertaken activities of training or awareness materials designed to communicate chemical safety issues to vulnerable groups such as , women, children, workers not speaking official national languages as highly exposed groups and the general public. This is should not be adhoc and need to be well coordinated.

- Although Kenya has done extensive research in some areas of chemical safety such as human health exposure; environmental impacts or exposure; safer alternatives and cleaner production technologies. This research is exclusively either in universities or intergovernmental organizations such as ICIPE[1]. Some organizations in Kenya maintain websites that provide publicly available information on chemicals in use; chemicals safety laws that apply in the country; hazards and risks associated with specific chemicals.

8.3 Exchange of Information

The exchange of national information among various ministries and other institutions and concerned parties is encouraged through forums such as national and project committees. Other mechanisms employed in information exchange include the use of electronic mail, newsletters, and government circulars and Annual State of Environment Reports. Information collection and exchange however, has not always been efficient and can become a costly process. However he cost of internet access is reducing and it expected that there will be an increase in electronic exchange of information especially e-government. Table 8.1 below summarises the quantity and quality of data available from various source categories and chemical classification.

Table 8.1 Quality and Quantity of Available information

8.4 Data avilability

Data Needed for/to:	Pesticides (agricultural, Public health and consumer use)	Industrial Chemicals	Consumer chemicals	Chemical wastes
Priority setting				
Assess Chemicals Impact under Local Conditions	Yes	X	X	No
Risk Assessment (environment/health)	Yes	Yes	No	X
Classification/labelling	Yes	Yes	X	X
Registration	Yes	No	No	No
Licensing	Yes	No	No	No
Risk Reduction Decisions	Yes	X	No	X
Accident Preparedness/Response	Yes	X	No	No
Poisoning Control	Yes	X	X	No
Emissions Inventories	No	No	No	No
Inspections & Audits (environment/health)	Yes	X	X	X
Information to workers	Yes	Yes	Yes	Yes
Information to the public	Yes	Yes	Yes	No
Others				

8.5 Location of National Data

Some data and information on chemicals in Kenya can be accessed through various ministries, agencies and institutions or non governmental bodies. Currently, information on import, registration, licensing, permits, poison control, emission inventories, inspection, information to workers and the general public, export and disposal can be obtained from national regulatory bodies through written requests addressed to the chief executives of those organizations. Data on risk assessment and risk reduction on specific chemicals can be obtained from the research institutions and non-governmental bodies under the same procedures though in some cases fees may be levied to access such data.

[1] ICIPE is also a Stockholm Convention Regional Centre researching non chemical alternatives to POPs currently working on alternatives to DDT.

Table 8.2 Location of National Data

Type of Data	Location (s)	Data Source	Who has Access	How to Gain Access	Format
Production Statistics	Individual enterprises	Enterprises	Government	On Request	Electronic/Hard Copy
Import Statistics	Enterprises KRA	KRA KNBS	KRA/Public	Public On Request	Electronic/Hard Copy
Export Statistics	Enterprise KRA	KRA	KRA/Public	Public On Request	Electronic/Hard Copy
Chemical Use Statistics	Enterprises Industry, MOH	Enterprises/ SOE	Lead Agencies/Public	On Request	Electronic/Hard Copy
Industrial Accidents	DOHSS	Enterprise Reports/SOE	DOHSS	On Request	Hard Copy
Transport Accident Reports	Police Department	Police Department	Police Department	On Request	Electronic/Hard Copy
Occupational Health Data (agricultural)	DOHSS,MOH,PCPB	Enterprises	PCPB	On Request	Electronic/Hard Copy
Literature	PCPB Researchers DOHSS	Enterprises Doctors Trade Unions	DOHSS	On Request	Electronic/Hard Copy
Poisoning Statistics	MoH, PCPB	Health Ministries, PCPB	Public	On Request	Electronic/Hard Copy
PRTR	None	None	None	-	-
Register	NEMA	NEMA	Public	On request	Hard copy
Hazardous Waste Data	NEMA	NEMA	Public	On Request	Hard Copy
Register of Pesticides	PCPB	PCPB	Public	On Purchase	Electronic/Hard Copy
Register of Toxic Chemicals	PCPB/NEMA	PCPB/NEMA	Public	On Purchase Website	Electronic/Hard Copy
Inventory of Existing chemicals	NEMA/CBS	NEMA/CBS	Public	On Request/ Purchase Website	Electronic/Hard Copy
Register of Imports	KRA/CBS	KRA	Public	On Purchase Website	Electronic/Hard Copy
Register of Producers	PCPB/ NEMA/KAM	PCPB/ NEMA/KAM	Public	On Request	Electronic/Hard Copy
PIC Decisions	PCPB/NEMA/MEMR	Rotterdam Convention Secretariat	Public	On Request	Electronic/Hard Copy

8.6 Procedure for Collection and Disseminating National/Local Data

Although there is no specific law guiding data collection and dissemination, various national regulatory institutions have the required expertise and are charged with the responsibility of collecting chemical data to support decision making for respective sectors. Also national research institutions and universities have obligation of supporting the government in data collection and dissemination to the public especially data pertaining to environmental monitoring, research as well as product quality.

8.6.1 Availability of International Literature

International literature dealing with chemical management is available in various government institutions, institutions of higher learning, research organizations and both NGO's and international nongovernmental organizations. Now through the Kenya Government's program, of e-government, internet is readily accessible to officers through ministerial and agency websites. The physical presence of IOMC organizations in Kenya namely UNEP, UNIDO, WHO, World Bank etc. makes it even more easier.

8.6.2 Availability of International Database

Access to international literature and databases is important to facilitate increase in availability of information and for its dissemination for the effective management of chemicals. Some published international literatures are available in relevant institutions. Access to global networks is possible through designated government officials whose work has direct relevance to Kenya's reporting obligation under international multilateral agreements especially those relating to chemicals and wastes.

Table 8.D lists some of the international databases accessible. It is notable access to other chemical information located on the internet is possible due to improvement in internet services,

Table 8.3 Availability of International Databases

International Database	Location (s)	Who has Access	How to Gain Access
ILO CIS	DOHSS	Public	Formal request
IPCS INTOX	NEMA	Officer	Visit library
Chemical Abstract Services Database	NoT Available	None	
Global Information Network on Chemicals (GINC)	Not Available	Public	Internet
Relevant Databases from Other countries	Research Institutions/International Organizations/Tertiary Institutions	Public	Formal request\

8.7 National information exchange systems

Though data and information could be available in key institutions, there is no formal policy on information exchange. Access to scientific information is normally a long and tedious process.

8.7.1 Chemical information Exchange Network (CIEN-Kenya)

Kenya launched a Chemical Information Exchange Network (CIEN) in MEMR website as a mechanism to support networking and collaboration among various stakeholders responsible for

the environmentally sound management of chemicals. The network links stakeholders at the national level through the use of a shared Web site. The network also helps stakeholders to access and exchange chemical information to support national decision-making and the implementation of multi-lateral environmental agreements (MEAs). This follows the guidelines issued by UNEP-CIEN program. In addition, the PCBP, the AAK have a very interactive websites which are regularly updated.

8.8 Comments/Analysis

There are various institutions with specialized data and information relevant to chemicals[1] . The information provided is on bulk imports exports, registration licensing, permits, , poison control, emission inventories, disposal , Environmental Impact Assessments and Environmental Audits, information to workers and general public. According to draft regulations, all producers, importers, and exporters will need to provide chemical data.

Industry (importers, manufacturers, distributors) and users have collectively the prime responsibility for managing chemicals during their entire life cycle. The GOK will supervise the process of inputing of data through the process of the Kenya National Bureau of Statistics, while encouraging active participation of all parts of civil society.
To allow GOK to play this role, all relevant information about chemicals and their use should be made available. These regulations will be formulated where absent, agreed upon among all relevant stakeholders and be embedded in legislation controlling the management of chemicals in Kenya.

Priority issues to be addressed include:

- Establishment of Inter institutional Coordination mechanism and National Chemicals Policy Committee, Thematic groups and networking e.g. CIEN-Kenya
- MoU on acquisition of data between institutions,
- Accelerate development of chemical management Regulations,

[1] Table 8B Kenya National Chemical Profile

9 CHAPTER 9: TECHNICAL INFRASTRUCTURE AND GOOD LABORATORY PRACTICE

9.1 Introduction, Data Storage, Analytical Capacity, Sampling and Sample Management

This chapter gives information on the technical infrastructure in the country related to the management of chemicals and the analytical capacity required for sound management of chemicals and wastes. In order to achieve the five objectives of SAICM, there is a need to carry out analytical tests to establish the different types of hazardous chemicals, their quantities and their properties in the environment. The hazardous chemicals are classified as explosive, flammable, corrosive, reactive, toxic are radio-active. Infrastructure to identify and quantify associated risks is necessary

There is therefore need to identify and establish laboratories in Kenya that can be used to support programs and policies for the management of chemicals. Such laboratories are those with analytical capabilities which can analyse the quality of chemicals, conduct residue analyses, identify unknown substances and monitor them for adverse effects to human health and environment.

According to the World Trade Organization (WTO) and the European Union (EU), the lack of acceptance of test results and certification are the most significant non-trade barriers to trade. Capacity for clear and acceptable analysis is therefore critical. In addition to the above benefit to chemical management, the capacity will help the Government to comply with obligations in terms of the Multilateral Environmental Agreements (MEAs) of which most are concerned with the release of chemicals to the environment. Laboratory testing is important in this regard because proof of pollution depends on the analytical tests carried out.

There is lack of coordinated national programs to improve the quality and quantity of relevant laboratories. With the establishment of the East African, there has been increased co-operation between the states in all aspects including environment and health. Recently a Bioequivalence conference was held in Nairobi to among others harmonize drug registration procedures so as to achieve good control of pharmaceutical standards without impeding or obstructing the movement of pharmaceutical products within the community and this includes the quality control of pharmaceuticals by the various laboratories. Kenya has two WHO prequalified Laboratories in NQCL and MEDS. Several others in the region are undergoing the same development

9.2 Overview of Laboratory Infrastructure

Most laboratories lack sufficient equipments for proper analysis. In general, laboratories have equipments such as ; GC, spectrometers, microscopes, library, lab equipment for soil and plant tissue analysis including x-ray, gas chromatographs, HPLC,s flame photometer, Centrifuges, UV, NMR, ion chromatograph, ion selective meter, PH meters, Radon emission meters, assorted laboratory glassware. Some laboratories like Kenya Plant Health Inspectorate Service, National Agricultural Research laboratory (NARL) Kabete have computers and internet facilities and library for data storage.

Most laboratories do not have the capacity and capability for analysis for randomly toxic chemicals. DDT, Aldrin, Heptachlor are analyzed at university of Nairobi Chemistry department. Kenya Plant Health Inspectorate Service laboratory analyses toxic chemicals in the soil water, plant tissue and animal tissue. No toxic chemicals are analysed at Olkaria geochemistry, the later is used to analyze chemical species of interest to geothermal development.

Table 9.1 Overview of Laboratory Infrastructure for Regulatory Chemical Analysis

Name/ Description of Laboratory	Location	Equipment available	Accreditation (if yes, by whom?)	Certified GLP[1] (yes/no)	Purpose/Objective
National Quality Control Laboratory – MEDs	KNH Complex, Nairobi	HPLC, AAS, UV/VIS, Autoclave, titro-processor, karlfisher, FTIR	Yes - WHO	Yes	Pharmaceutical and Medical Devices testing
MEDS	Nairobi	HPLC, AAS, UV/VIS	Yes - WHO	Yes	Pharmaceutical testing
National Public health Laboratories	KNH Complex, Nairobi	Chemical Analyzers, HPLC, AAS,			Food & animal feeds, micro-organism, blood, sputum, urine, stool tests,
Centarl eater Testing laboratory	Nairobi	AAS, UV/VIS, BOD incubator, COD, digester, Autoclaves, photometer	No	No	Portable Water, Micro-organism & Effluent water testing
Government Chemist	KNH Complex, Nairobi, Mombasa Kisumu	HPLC, AAS, GC, UV/VIS, , FTIR.	No	No	Toxicological analysis, forensics, food & drugs and other chemicals substances, water and waste water
KEPHIS	Karen, Ngong Nairobi	GC, HPLC, AAS, Flame Photometer, UV/VIS, FTIR	Yes - ISO	Yes	Analysis of Pesticides, fertilizers, water, soil, micro & macro elements, agricultural inputs & produce, seed quality certification.
JKUAT	Thika Road, Juja	GC, AAS, , FTIR, UV/VIS Flame Photometer, Hydride Vapour generator	No	No	Testing pesticides, micro-organisms, heavy metals, hydrocarbons,
SGS	Mombasa	AAS, GC, UV/VIS, XRF	Yes - SANAS	Yes	Petroleum, air emissions, food & agricultural products, noise, effluent water.
KIRDI	Dunga Road, Nairobi	UV/VIS, AAS	No	No	BOD, COD, Heavy metals, effluent water, food & agricultural products, minerals, petroleum products
Mines & Geology	Machakos Road, Nairobi	AAS, XRD, XRF,ion meter	No	No	Heavy metals, portable & effluent water, sediments, soils
Department of Chemistry, University of Nairobi	College of Biological and Physical Sciences	AAS, NMR, GC, HPLC, UV, IR, Flame Photometer,	No	No	Environmental and industrial chemicals analysis

9.3 Computer Capabilities

9.3.1 National Infrastructure

Information and Communication Technology (ICT) may be defined as computer hardware, software and telecommunications technology. ICT is the World's fastest growing economic activity; the sector has turned the globe into an increasingly interconnected network of individuals, firms, schools and governments communicating and interacting with each other

through a variety of channels and providing economic opportunities transcending borders, languages and cultures. ICT has opened new channels for service delivery in areas such as e-government[1], education, e-health and information dissemination.

Rapid development of ICT accompanied by the convergence of telecommunications, broadcasting and computer technologies is creating new products and services, as well as new ways of learning, entertainment and doing business. At the same time, more commercial, social and professional opportunities are being created through the unique opportunity provided by ICT.. The new society promises a fundamental change in all aspects of people's lives, including knowledge dissemination, social interaction, economic and business practices and political engagement.

9.3.2 ICT and Chemicals Information Networking

During the launch of the fibre optic cable in Mombasa the Government noted that a world equipped with I.C.T. and interconnected by fibre-optic cables has much better disaster preparedness and turnaround capabilities than the world of the 1930's. Thanks to I.C.T. the world now is truly a global village with better communication and is now better informed. This is now being applied to facilitate access to information among government ministries.

Table 9.B shows the computing facilities available at various locations.

Table 9.2 Information Technologies

Computer System/Database	Location	Equipment Available	Current Uses
All Ministries	Nairobi	LAN, Servers, computers	Internet access, office automation
GITS	Treasury	LAN, Servers, computers	Website hosting and email re-direction
CIEN	Nairobi	LAN, Servers, computers	Networking and collaboration of stakeholders for sound management of chemicals
NEMA	Nairobi	LAN, Servers, computers	Internet access, office automation, Database sharing
NPHLS	Nairobi	Country wide Information System, LAN, Servers, computers	Internet access, office automation, Lab works information sharing
KIRDI	Nairobi	LAN, Servers, computers	Internet access, office automation

Government Information Technology Services (GITS) in the Office of the Deputy Prime Minister and Finance is a department charged with developing and implementing ICT policy and related infrastructure within the public sector and these includes all government ministries and parastatals. The functions of GITS are:

- Developing and implementing an appropriate ICT policy for the public sector.
- Advising the government on matters related to ICT.
- Networking and the equipping of the entire public sector with appropriate ICT facilities.
- Providing the necessary ICT interface between the public sector and stakeholders.
- Offering technical advice on the procurement of ICT equipment.
- Updating ICT in government to keep pace with technology with the rest of the world.
- Ensuring optimal operation/use of ICT through training and other capacity building interventions processes and keeps pace with the world.

[1] www.**e-government**.go.ke

9.3.3 CIEN for Chemicals in Kenya

The Chemical Information Exchange Network (CIEN) is a network of people involved in the management of chemicals. It is a mechanism that helps networking and collaboration among various stakeholders responsible for the environmentally sound management of chemicals. It is also a way to link people at the national level through the use of a shared Web site and a means to create regional and international networks by linking national Web sites. It also is the framework that aids the access to and exchange of chemical information that supports national decision-making and the implementation of multi-lateral environmental agreements (MEAs).[1]

CIEN Kenya was launched on the 22nd of October 2008 and was preceded by various build-up activities that included: ESTIS webmaster training, CIEN Training and Stakeholders Meeting. ESTIS is a multi-language, Information System (IS) management tool to assist the transfer of Environmentally Sound Technologies (EST). ESTIS encompasses two integrated components providing a decentralized IT network for improved access and local control in EST related information transfer. The ESTIS concept has been driven by an international group of people dedicated to EST transfer for sustainability. ESTIS is important to Kenya because it will help in information sharing across the country. With ESTIS information on chemicals and waste, Environment, and research work can easily be shared easily and with security. Countries can also share information on environmental projects. Storage of information in ESTIS network servers is an added advantage since it can be accessed anywhere and anytime.

9.4 Overview of Technical Training and Education Programmes

In Kenya there are over 200 training institutions ranging from technical training level to university level. Most of these institutions have training and education programs aimed at providing technical expertise related to chemical management. The following institutions have programs related to chemistry, toxicology, environmental sciences, and environmental engineering;

9.4.1 Universities

Undergraduate and postgraduate programmes in various areas of chemicals management are offered at various universities which include both public and private universities. Kenyatta, Moi, Nairobi, Egertonne, Maseno, Jomo Kenyatta University of Agriculture & Technology , Masinde Muliro University of Science & Technology, Aga Khan University, Kiriri Women's University of Science & Technology, Kenya Methodist, University of Eastern Africa Baratonne & Mt Kenya University

Each of these colleges has programs that address an aspect of chemicals management in the field of engineering, food science and technology, chemicals engineering et**c**

Colleges;

Colleges a a rank lower that normal universitirs. Thus are seen to offer lower level courses on chemicals in applied and pure chemistry. Annex 2 is a list of colleges

9.4.1 Programs & Activities

There are various capacity building programs and activities that have been ongoing. However since they are offered under different projects, they have lacked a coordinated approach towards addressing matters pertaining to chemicals management.

[1] http://www.estis.net/sites/kenya/

Under the industrial act, the Directorate of Industrial Training (DIT)[1] regulates the training of persons, engaged in industries which includes those manufacturing soap or detergents, cement, lime, asbestos, soda ash, fluorspar, rubber, rubber bands and other rubber products, plastics, petroleum or its solvents and other by-products including bitumen, bitumen solutions, turpentine, wood preservatives, concrete mould oil, paints, waxes for any use, dyes or coloring materials, gasses, pesticides, any type of glass, drugs or other pharmaceutical products, chemicals or chemically based products which require knowledge of sound management of chemicals and most industries do have quality control laboratories which can also be to monitor risks.

9.5 Comments/Analysis

As governments and industry strive to expand the chemical industry and other industries, one of the key challenges is the development of sufficient capacity for chemical testing. Due to the health and environmental risks that chemicals pose, chemical testing is an integral part of production and use of chemicals in a great number of products. It is said that over 50% of all industrial tests are chemical in nature. It is important to note that the number of laboratories practicing good laboratory practices is very low and there is a need to extend the number of laboratories performing chemical testing and also expand the scope of laboratories that are compliant with OECD/GLP[2] principles and testing guidelines hence the need to increase the capacity of these laboratories.

There is general need in Kenya to provide training programs in chemical information work for the sector of collecting, collating, storage, retrieval and dissemination of risk and hazard of chemicals. This NCP has identified training needs in Kenya and broad categories of information related work. The most relevant in this case being:

i) Management Information Systems at the user level;

ii) Research and Information Work for chemical under international regulatory framework;

iii) Information work including public relations on occurrence of accidents and

iv) Documentation of data and incidences of poisoning and fires.

Many institutions have curricula on covering various aspects of chemicals management. Some training on risks of chemical hazards are taught from the primary school level.

[1] www.ditkenya.org/
[2] www.oecd.org

10 CHAPTER 10: CHEMICALS EMERGENCY PREPAREDNESS, RESPONSE AND FOLLOW UP

10.1 Disasters

The purpose of this chapter is to give an overview of the capacity of the country related to preparedness for response to, and follow up of, emergencies involving chemicals. Chemical emergencies can arise from industrial, transport, or incidents involving consumption of toxic substances including wastes. The incidents can be accidental or deliberate such as contamination of food, drinking water, or consumer goods. The chemical accidents could be anthropogenic or natural sources such as earthquakes, floods, storms destroying facilities containing chemical materials which are then released into the environment, or volcanoes releasing toxic fumes.

Usually emergency incidents involve many people and animals and contamination environment putting pressure on health services. In some cases the emergencies may also lead to destruction of the communication networks such as telecommunication and transport systems. There is therefore need for adequate emergency preparedness.

10.2 Kenya Disaster Profile

Kenya's disaster profile is dominated by droughts, fire, floods, terrorism, technological accidents, diseases and epidemics that disrupt people's livelihoods, destroy the infrastructure, divert planned use of resources, interrupt economic activities and retard development. In the pursuit of reducing vulnerabilities to risks, the Government has formulated this National Policy on Disaster Management to institutionalize mechanisms for addressing disasters. The policy emphasizes preparedness on the part of the Government, communities and other stakeholders in Disaster Risk Reduction activities. In this regard, the policy aims at the establishment and strengthening of Disaster Management institutions, partnerships, networking and main streaming Disaster Risk Reduction in the development process so as to strengthen the resilience of vulnerable groups to cope with potential disasters. Ministry of State for Special Programmes in the Office of President coordinates Disaster Risk Reduction initiatives within a unified policy framework in a proactive manner at all levels. Disaster Risk Management encompasses a full continuum from preparedness, relief and rehabilitation, mitigation and prevention. The Policy aims to increase and sustain resilience of vulnerable communities to hazards through diversification of their livelihoods and coping mechanisms. This entails a shift from the short term relief responses to development.

10.2.1.1 Disaster Management

There is neither a coordinated policy framework nor a legal basis for the current disaster management system. What exists is partly a spontaneous system, which has assisted the Government and its development partners (the UN system and other relief agencies) to respond to disasters in the country. Other participants in disaster management include specialized departments such as the National Disaster Operation Centre (NDOC), the Police, the Department of Defense, the National Youth Service (NYS), local Fire Brigades, St John's Ambulance Service, Kenya Red Cross Society, Occupational Health and Safety Services, Kenya Wildlife Services and the National Environment Management Agency (NEMA). These undertake pro-active and responsive disaster-related activities, including Environmental Impact Assessments. Attachment 1 is a list of past disaster in general.

10.2.1.2 Linkages

Linkages will also be made with existing relevant national legislation including the Environmental Management and Coordination Act No.8 of 1999, The Kenya Red Cross Society Act (Cap 256), The water Act (Cap 372), Grass Fire Act (Cap327), Petroleum Act (Cap 116), 4.2.6, The Explosives Act (Cap 115),St. Johns Ambulance of Kenya Act (Cap259), Factories Act (Cap 514), The Local Authority Act (Cap 265), The Chief's Act (Cap 128),The Children's' Act, Police Act, The Prison's

Act, and the various Acts creating the ArmedForces, The Acts creating Polytechnics and Technical Colleges, Educational Act, etc

10.3 Chemical Emergency Plan

The organization, protection and rescue during disasters caused by hazardous substances is coordinated by different departments and levels in the country. Normally, the first respond is Kenya Police followed by the local authority. Other institutions are brought in cases where the disasters are large, such as industrial accidents leading to fires, road accidents leading to explosions spills and accidental releases etc.

Fig 10.1 Accident of trailer carrying sulphuric Acid
Source: By NATION Team November 13 2009 at 22:00 Photos/HEZRON NJOROGE

One person died and scores of passengers were severely burnt by acid when a lorry carrying the corrosive liquid collided with a bus in Molo on Thursday night. The accident took place near the site of the oil tanker disaster. Inset: A prison warder nurses burns sustained in the latest accident. The accident occurred when a trailer loaded with some 500 containers of sulphuric acid rammed the Climax Coaches bus, which was carrying 67 passengers, mostly traders who were headed for Eldoret and Kitale towns.

The vehicles burst into flames minutes later. Fortunately, the passengers had jumped out through the windows and door. The trailer driver was burnt to death after being trapped in his cabin. His loader, Mr Bernard Makori, 28, was thrown out of the cabin and landed into the stream of acid. He suffered serious burns on the face, arms and legs. This was the harrowing scene at Sachang'wan in Molo, which is fast becoming synonymous with disaster. In January, an oil tanker fire in the area killed some 130 villagers, now buried in a mass grave.

10.3.1 NEMA ROLE IN EMERGENCOIES

NEMA performs the following duties, which are important in the protection against disasters caused by hazardous substances:

- Prepares proposals for research and development projects on protection against natural and other disasters,
- Is responsible for informing and raising the alarm during disasters caused by hazardous substances as well as documenting environmental impacts.
- Makes an assessment of the level of danger and prepares other expert documentation necessary for planning protection, rescue and aid, and directs and coordinates measures for the prevention and reduction of the effects of natural and other disasters, in collaboration with other ministries and agencies.
- Monitors and announces the threat of natural and other disasters as well as issue instructions for action.
- Direct the organization of local community protection, rescue and relief forces and organizes forces for protection, rescue and aid for other purposes.
- Has an emergency response call number

10.3.2 Kenya Police

The Kenya Police and the disciplined forces are currently responsible for first time response, protection and rescue action during disasters which could be caused by hazardous substances, explosions, fires and contaminations. The activities conducted include the following measures such as Informing, alerting and raising the alarm, Activating forces for defense, rescue and relief, Coordinating, rescue operations, Directing protection and rescue operations, and Executing emergency repair and remedial work.

10.4 Past Chemical Incident Impacts and Responses

There have been several incidents of chemical poisoning with heavy losses of human life and property. Table 10.1 lists various incidences that have occurred in the recent past involving chemicals

Table 10.1 Chemical Incidences in Kenya

Date of incident	Location[1]	Type of incident[2]	Chemical(s) involved	D:Number of deaths I:Number of injuries E:Numbers evacuated	Environmental contamination or damage [4]
24/ june/ 2001	Eldoret-Kaptagat	Rail accident Rail-C41/9404	Oil product	Injuries	Soil contamination
14/sep/ 2001	Kisumu Port	Explosion of an oxygen cylinder	Oxygen gas	Several injuries	Air contamination
15/may/2001	Kenya Pipeline Company-Kisumu	Truck overturning	Fuel	Injuries and fire	Soil contamination
13/aug/1998	Kenya Pipeline Company-Kisumu	Truck overturning	Oil product	Injuries' and fire	Soil contamination
28/sep/1998	Kenya Pipeline Company-Kisumu	Truck explosion	Motor gasoline-premium	Injuries and fire	Air contamination
1999	Sindindi	Truck overturning	Motor gasoline-premium spill	D- several	Soil contamination
	Suam, Kenya	Truck overturning	AGO	No data	Soil contamination
	Panpaper Mills-Webuye	Locomotive/truck collision	Fuel oil/32,000 I	No data	Air contamination
29/june/2001	Road Accidents	Truck accidents (Caltex)	Petroleum	No Data	Oil
30/oct/2001		Truck accidents-Kobil	AGO-37,000 I	No Data	
Jan/2002	Shell-Kisumu	Oil product spill	8 tonnes-diesel	No data	Soil contamination
2009	Sachangwan	Petrol spill and fire explosion	petrol	D:131	Air and soil contamination
1996	Makupa causeway	Oil spill	Oil	0	Air, sea and soil contamination
2000- 2009	Marsabit poisoning	Chemical contamination	Nitrate Arsenic	Allegations	Soil and water contamination
	Devki Steel mills-Athi river	Fire explosion	Hydrocarbon	No data	Air contamination
Dec.2009	Awasi oil spill-Kisumu	Truck accident	Oil	No data	Soil contamination
	Kibera-Nairobi	Rail accident	Oil	No data	Soil contamination
	Kobil-Lang'ata Rd.-Nairobi	Petrol station fire	Oil		Air contamination
2002	Kyanguli-Machakos	Fire	Normal	D:59 I:28	
	Maasai Mara	Lion deaths	Alleged furadan	(7 lions)	Loss of wildlife
2005	Mai mahiu	Cattle deaths		(100 cows)	Loss of livestock
	Machakos, Murang'a	Methanol poisoning	Methanol poisoning	D50	Loss of human life
	Nakuru,	Quillea deaths	Pesticide	None	Loss of wild life
2002	Kikambala-Kilifi	Bomb explosion	explosives	D:13 I:80	Loss of human life
1998	US embassy-Nairobi	Bomb explosion	explosives	D:over 200 I:over 3000	Loss of human life

Lend D: dead

I: injured

10.5 Chemical incident follow-up and Evaluation

In the above cases, usually emergency response is provided by the police and local authorities.

10.5.1 Preparation of Protection and Rescue Plans

The fundamental aim of protection and rescue plans is to prevent the occurrence of chemical disasters or to reduce their effects and ensure the quickest provision of safe living conditions in the affected area. The protection and rescue plans are be prepared by:

i) municipalities - municipal protection and rescue plans;
ii) commercial enterprises, institutions and organizations which process, use, manufacture, transport or store hazardous substances, oil and its derivatives and energy gases, and which perform activities or operate with such means of production as pose a potential danger for disaster;
iii) Commercial enterprises, institutions and of organizations determined by the local authority.

The protection and rescue plans help in informing, alerting and raising the alarm in the case of danger or during a disaster which may include:

i) mobilizing and activating,
ii) directing protection, rescue and relief operations,
iii) executing protective measures, and
iv) Rescue and relief.

10.5.2 Observation, Notification and Warning of Incidents

The Disaster Management Committee, in the Office of The President, is in charge of national policy guidance in disaster management. Observation, notification and warning in the case of danger or during a disaster are performed by information centres. Their responsibilities include the following:

i) to gather, process and disseminate the information for protection, rescue and aid,
ii) to inform inhabitants and raise the alarm about threat of danger to notify and activate rescue services and medical services offering protection, rescue and aid,
iii) to notify municipal and state bodies about scope of dangers or disasters and to,
iv) To assist in the provision of logistic support.

The St John Ambulance and The Red Cross are currently the only organisations that undertake the above tasks, however, Kenya now has a national institution charged with the responsibility of carrying out these activities.

10.5.3 Danger Observation, Monitoring and Response

For predicting potential chemical accidents, the Kenya fire and Safety surveys institutions and helps in the monitoring of danger. This is conducted on the basis of the following:

i) Information provided by inhabitants and organisations for insurance purposes.
ii) observations or information provided by the fire brigade, foresters, hunters, fishermen, automobile associations, aviation clubs, railway, road and other commercial enterprises, institutions and organisations to local authorities.
iii) information given by Kenya Meteorological Department in charge of observatory and supervisory services, organized to monitor meteorological, hydrological, seismological, radiological, ecological and other circumstances,
iv) International exchange of data and information and early warning programme of UNEP.

10.6 Protection, Rescue and Relief Agencies

Protection, rescue and aid are to be offered by the following departments:

i) the fire brigade, municipal, ports, Kenya Airports Authority and the Kenya Airways

ii) Commercial enterprises, institutions and other organizations which have the staff and material capabilities for performing protective, rescue and aid operations, upon authorization by municipalities through fire emergency preparedness and the safety committees under NOSH.

iii) First aid units, first veterinary aid units, technical rescue units, radiological, chemical and biological protection units, for private sector enterprises such as the Kenya Oil Refinery and Fire Brigade.

iv) The Police and the Kenya Army.

10.6.1 Directing protection and rescue

Kenya Government works closely with the Kenya Red Cross, St John's Ambulance and the Armed Forces in directing protection and rescue forces. The Government supports in:

i) guiding and coordinating the organization, preparations and implementation of protection against disasters, through police
ii) approving the annual plan of protection against disasters,
iii) approving the national protection and rescue plan,
iv) directing protection, rescue and aid operations and removing the effects of big disasters,
v) Administering international aid during disasters.

In municipalities, the town clerks are usually responsible for the following:

i) the preparation of measures for protection against disasters especially arising from fires,

ii) the approval of protection and rescue plans at the local levels,

iii) the implementation of measures for the prevention and reduction of disasters,

iv) directing protection, rescue and relief operations during disasters,

v) Informing inhabitants about dangers, and about the situation regarding protection against disasters and the protective measures taken.

In order to facilitate the expert administration of protection, rescue and relief operations, the Government and mayors shall appoint commanders and organize civil protection headquarters through fire drills. However, only in very few cases are chemical accidents drilled.

10.6.2 Special Competencies of Civil Protection Coordinators and Heads of Emergency Operations

The EMCA and related regulations provide facilitations for such emergencies including;

- the displacement of people, animals and property,
- entry into a house/premises
- the use of particular communications equipment or its installation in the premises
- the removal of barriers preventing successful emergency intervention,
- the compulsory participation of inhabitants in rescue operations in accordance with their capabilities and equipment that may be appropriate for rescue,

These typical provisions do not provide for handling chemicals NEMA is to make regulations for operation protection and rescue operations during accidents caused by hazardous substances on roads and the removal of their effects is conducted in accordance with their competencies, directed by the police, the head of the local authority handling emergency operations, and the head of the regional branch of the Administration, based at the Ministry of the Environment and Mineral Resources through emergency lines.

The duty of the police is to notify the technical ministry. The police request the necessary assistance to protect the disaster area and the threatened area and they are also charged with organizing emergency measures for protection and rescue and for the prevention of further damage until the arrival of the head of the emergency operation or the competent inspector.

The head of the rescue operation shall take over leadership in the implementation of protection and rescue measures and in the prevention of further damage, in accordance with the tasks of the emergency unit or team. It has been noted that in case of chemicals usually little is salvaged.

10.7 Measures Taken During a Disaster Caused By Hazardous Substances

Table 10.2 Response Mechanisms after a Chemical Incident

Documentation	Action Taken	Primary Responsibility
Verbal Or Written Report About Disaster	Reporting the Disaster	Anyone Who Discovers Disaster, The Police
Electronic Media	Activating The Emergency Unit of the policed	To inform
Data and Information Plan	Notifying Competent Bodies And Services	No one currently with responsibility
Results Of Analyses And Investigations Records Of Measures Taken	Assessment Of Situation	expert groups
Records On Field Inspection Resolution	Providing Additional Protection And Rescue Measures	Local Authorities
Report On Emergency Operation	Repairing The Damage Caused By The Disaster	Protection Of The Environment

10.7.1 Repair work

The repairing of the damage after disasters caused by hazardous substances is carried out, primarily, by communal and other public services, but is generally lift to the owner of the premises.

10.8 Stakeholder involvement

All disaster assistance will affect the prospects for long term development, either in positive or negative fashion. Recognizing this, all stakeholders will strive to implement emergency er assistance programmes which actively reduce the beneficiaries' vulnerability to future incidences and help create sustainable lifestyles. For chemical incidences, stakeholders will reinforce the capacity of local communities to manage the full disaster Cycle and therefore all people and communities even in emergencies will possess capacities as well as vulnerabilities.
Where possible, stakeholders should strengthen these capacities by employing local staff and procuring local resources. All activities in Disaster Management should reinforce rather than undermine existing capacities. The Government and stakeholders can involve communities in the

design, management, implementation, monitoring and evaluation of emergencies programmes.
Mainstreaming Women and Children Issues
In all disaster management incidences, Government and partners stakeholders and communities can take positive cognizance of the excessive impacts which women and children undergo in any disaster.

There is no evidence that stakeholders pay particular attention to environmental concerns in the design and management of emergencies, constantly reviewing the status and trends of the environment to ensure sustainable compliance. It is clear from the above, that the Government will take the leadership role by articulating a clear policy to guide Disaster Management activities and to enable other stakeholders to harmonize, align and coordinate Disaster Management activities along with the Government needs and Disaster Management priorities. All this requires policy, legal and institutional frameworks which embed Disaster m management in the Government with the regular allocation of public resources to achieve the desirable goal and objectives.

Primary requirements for successful rescue operations in the course of and after the disaster are good organisation of activities, carried out by a highly specialized teams using good equipment. Additional preventive measures are required, including simulations of possible scenarios, training of professionals and obtaining modern rescue equipment. As has been learnt from incidences described above emergency response is one of the weakest aspects of chemical wastes. There are no competent authorities to deal with emergencies except for large enterprises and corporations. There is need for feedback between insurance companies and government to quantify loses and prepare for better emergency preparedness.

10.9 Emergencies of petroleum transport

Elimination of petroleum road tanker accident`s is the desire of all oil industry players. This is because of many undesirable disasters and negative publicity associated with them. However, this is unachievable. Regardless of the mode of transportation, any petrochemical substances in transit presents potential hazard to the transport crew, public and environment in general. This is because in the event of a spill, the product is hardly recovered leading to environmental degradation and ecological related impacts. In some case human safety as well as health is at stake.

Unlike marine oil transport in Kenya which has a well stipulated tier 1 response capability for any marine oil spill through an initiative by the oil industry known as Oil Spill Mutual Aid Group (OSMAG), it is unfortunate that terrestrial and inland waters don't have. This is too ironical considering vulnerability of terrestrial and inland waters where the probability of spills is high and impacts are severe. Some possible impacts linked to terrestrial oil spill traverses through environment, heath and safety. This though is not only limited to mankind but other organisms within the entire ecosystem too.

Other than environmental degradation and ecological damage, there is the element of safety and health that requires attention too. The feasible solution lies in quick response. Effectiveness of any response relates inversely with action-time. Action-time on the other hand has a direct relationship with proximity. Based on this, there is need for setting up response centers at a close proximity to address and attend to terrestrial chemical spills in the event of accidents.Petroleum Institute of East Africa is the lead institutions bringing together oil industry players. They intend to:

i. To establish emergency response centers along the main highways used for transportation of chemicals including hydrocarbons.
ii. To constitute and train emergency response teams along the main highway used in the transportation of chemicals.
iii. To establish working relationship with the nearby equipment owners and service providers.
iv. To acquire a shortfall of the equipments.

v. To actualize timely response to chemical related emergencies (including rollover accidents and spillages).

The following measures are being taken

i. Fifteen established emergency response centers along the main transit corridor ith an office and communication equipment.
ii. A team of at least five trained emergency members per response centre.
iii. Dvelop a catalogue of equipment and their nearest location.
iv. Signed memorandum with ownership of the equipment on terms of use in cases of emergency.
v. Inventory of acquired equipment.

10.9.1 Comments and Analysis

Chemical accidents and incidents have severe impacts on human health and the environment. They result in loss of income for enterprises that experience such accidents. The NCP has indicated that proper emergency response procedures need to be in place in cases when an accident cannot be prevented. Emergencies to be considered under SAICM include chemicals accidents and poisoning prevention, treatment and control as adequate capacity for preparedness and response does not exist.

11 CHAPTER 11: AWARENESS/UNDERSTANDING OF WORKERS AND THE PUBLIC

11.1 Introduction

The purpose of the chapter is to provide an overview of the mechanisms available to provide information to workers and to the public concerning the potential risks associated with chemical production, import, export, handling, use and disposal. Concerted action on good chemicals management, clearly linked with a broad range of health and environment issues provides significant benefits to the workers, the poor and the vulnerable groups. Such benefits include reducing poverty, hunger, child mortality and ensuring environmental sustainability.

Chemicals are an integral part of everyday life with over 100,000 different substances in use**.** Industries producing and using these substances have an enormous impact on employment, trade and economic growth worldwide. There is hardly any industry where chemical substances are not implicated and there is no single economic sector where chemicals do not play an important role. However, besides the benefits from chemicals it is increasingly recognized that they also have the potential to adversely impact human health and the environment if not managed properly. The health related effects range from acute poisoning to long term effects, such as cancers, birth defects, neurological disorders, and hormone-disruption.

11.2 Awareness and Understanding of Chemical Safety Issues

Chemicals in the environmental media present a threat to human health and the surrounding natural resources. In order to identify the impacts of hazardous waste one needs to look at tell tale signs for example, in surface water contamination of food and air. The health of animals and humans are affected when they drink or bathe in contaminated water. Death of animals and sicknesses are manifested. Contaminated ground water can adversely affect animals, plants, and humans if man-made or natural processes remove it from the ground. Depending on the geology of the area, ground water may rise to the surface through springs, or flow laterally into ponds. Contamination in the soil can harm plants when they take up the contamination through the roots. Ingesting, inhaling, or touching contaminated soils, as well as eating plants or animals that have accumulated the soil contaminants can adversely impact the health of humans and animals.

11.2.1 Contamination of Ground Water

One of the most common groundwater contaminants in rural areas are nitrates. They are regulated in drinking water primarily because excess levels can cause methaemoglobinemia, or "blue baby" disease. Although nitrate levels that affect infants do not pose a direct threat to older children. Nitrates in drinking water starts affecting the health of the general populace at levels in the range of 100 to 200 mg/l nitrate-N, but the effect on any given person depends on many factors, including other sources of nitrate and nitrite in the diet. Some of the nitrate consumed can be converted in the body to nitrite, which under appropriate circumstances can combine with amines (portions of protein molecules often found in foods, medications, cigarette smoke, decaying plants, soil, and sometimes water) to form nitrosamines, well- documented cancer-causing substances. So far, the only studies linking nitrate in drinking water with cancer have involved nitrate levels that are quite high (at or above 100-200 mg/l nitrate-N). Nitrate contamination is prevalent in the whole of North Eastern Province. The other organic pollutant is the fluoride level in Central Kenya causing the mottling of teeth, a condition referred to as dental flurosis.

11.1.2 Heavy Metals

There are also examples where chemical contaminants released from dumping sites have caused direct harm to humans and, more commonly, destroyed environmental resources to the extent that they can no

longer be used for human dwelling or activities. A study [1]of one of Africa's largest waste dumpsites, the Dandora Municipal Dumpsite in Nairobi, found that half of the children tested in the area surrounding the dumpsite had concentrations of lead in their blood exceeding internationally accepted levels. 42% of soils samples from the dumpsite recorded lead levels almost 10 times higher than those found in unpolluted soil. The children had been exposed to pollutants such as heavy metals and other toxic organic substances through soil, water and air (smoke from burning of waste) leading to respiratory, gastrointestinal, and dermatological diseases. Almost half of the children tested had respiratory diseases, including chronic bronchitis and asthma (UNEP, 2007) which are expected to be products of gases from open burning of waste which includes dioxins and furans[2].

11.1.3 Recycling Alcohol

Additional risks can occur from direct contact with toxicants from poorly managed wastes such as, batteries and vehicle tyres. Of particular concern is scavenging in waste disposal sites, which involves manual sorting of waste to recover sellable or reusable components, and the handling of waste from health care facilities, which carries risks of needle-stick injuries and exposure to toxic or infectious materials.

11.1.4 Pesticides

The exposure to pesticides occurs in the workplace, during manufacturing, packaging, mixing, storage and transportation. It may similarly occur during application or from accidental or deliberate exposure through food, air and water, resulting into either acute or chronic toxic effects. The Table 1.1 presents the pesticide poisoning data as reported by the Government chemist in 2007.

11.1.5 Biological pest control

Unwanted creatures that infest households, buildings, or surrounding areas are pests that can pose serious risks to health and safety. The most common pests are roaches, rats, mice, spiders, termites, fleas, ants, and bees. It is a pest control worker's job to remove them.

Pest control workers locate, identify, destroy, control, and repel pests. They use their knowledge of pests' biology and habits, along with an arsenal of pest management techniques such as applying chemicals, setting traps, operating equipment, and even modifying structures to alleviate pest problems. The final choice of which type of pest management is used often is decided by the consumer.

11.3 Affected Communities

In recent years, FAO's Plant Protection Service (AGPP), and in particular its Pesticide Management Unit has been sounding the alarm about the existence and dangers of highly hazardous pesticides. It works with developing countries, donor agencies and industry to forge effective solutions to these harmful substances. The experience gained by the AGPP in the area of pesticide prevention and management is unique among intergovernmental agencies. FAO links its normative programs on pesticide management with technical field programmes, legal advice and wider agricultural crop production programmes to provide an integrated package of services to countries that no other agency is able to offer. The agency is ideally positioned to assist governments, such as Kenya, in the development and implementation of comprehensive,safe and effective projects for the management of pesticides

[1] Environmental Pollution and Impacts on Public Health: implications of the Dandora Municipal Dumping Site in Nairobi, Kenya, web:http//www.unep.org/urban.environment

[2]Joseph DG et al The Egg Report 2005: Contamination of chicken eggs from 17 countries by dioxins, PCBs and hexachlorobenzene, IPEN , www.ipen.org

11.3.1 Pest control workers

Pesticides are not pest control workers' only tool. Pest control workers increasingly use a combination of pest management techniques, known as integrated pest management. One method involves using proper sanitation and creating physical barriers. Pests cannot survive without food and will not infest a building if they cannot enter it. Another method involves using baits, some of which destroy the pests and others that prevent them from reproducing. Yet another method involves using mechanical devices, such as traps, that remove pests from the immediate environment.

11.3.2 Pest control supervisors

Pest control supervisors, also known as operators, direct service technicians and certified applicators. Supervisors are licensed to apply pesticides, but they usually are more involved in running the business. Supervisors are responsible for ensuring that employees obey rules regarding pesticide use, and they must resolve any problems that arise with regulatory officials or customers. Most States require each pest control establishment to have a supervisor. Self-employed business owners usually are supervisors.

Work environment. Pest control workers travel to visit clients. Pest control workers must kneel, bend, reach, and crawl to inspect, modify, and treat structures. They work both indoors and out, in all weather conditions. During warm weather, applicators may be uncomfortable wearing the heavy protective gear; such as respirators, gloves, and goggles that are required for working with pesticides.

There are health risks associated with pesticide use. Various pest control chemicals are toxic and could be harmful if not used properly. Health risks are minimized, however, by the extensive training required for certification and the use of recommended protective equipment, resulting in fewer reported cases of lost work. About 47 percent of all pest control workers work a 40-hour week, but 26 percent work more hours. Pest control workers often work evenings and weekends, but many work consistent shifts.

11.3.3 Painters

Millions of items ranging from cars to candy are covered by paint, plastic, varnish, chocolate, or some other type of coating solution. Painting or coating is used to make a product more attractive or protect it from the elements. The paint finish on an automobile, for example, makes the vehicle more attractive and provides protection from corrosion. Achieving this end result is the work of painting and coating workers.

a) Painting operations

Before painting and coating workers can begin to apply the paint or other coating, they often need to prepare the surface. A metal, wood, or plastic part may need to be sanded or ground to correct imperfections or rough up a surface so that paint will stick to it. After preparing the surface, the product is carefully cleaned to prevent any dust or dirt from becoming trapped under the paint. Metal parts are often washed or dipped in chemical baths to prepare the surface for painting and protect against corrosion. If the product has more than one color or has unpainted parts, masking is required. Masking normally involves carefully covering portions of the product with tape and paper.

After the product is prepared for painting, coating, or varnishing, a number of techniques may be used to apply the paint. Perhaps the most straightforward technique is simply dipping an item in a large vat of paint or other coating. This is the technique used by dippers, who immerse racks or baskets of articles in vats of paint, liquid plastic, or other solutions by means of a power hoist.

b) Spray Painters

Spraying products with a solution of paint or some other coating is also quite common. Spray machine operators use spray guns to coat metal, wood, ceramic, fabric, paper, and food products with paint and other coating solutions. Following a formula, operators fill the machine's tanks with a mixture of paints or chemicals, adding prescribed amounts of solution. Then they adjust nozzles on the spray guns to obtain the proper dispersion of the spray, and they hold or position the guns so as to direct the spray onto the article. Operators also check the flow and viscosity of the paint or solution and visually inspect the quality of the coating. When products are drying, these workers often must regulate the temperature and air circulation in drying ovens.

c) Automatic Painting Jobs

Some factories use automated painting systems that are operated by coating, painting, and spraying machine setters, operators, and tenders. When setting up the systems, operators position the automatic spray guns, set the nozzles, and synchronize the action of the guns with the speed of the conveyor carrying articles through the machine and drying ovens. The operator also may add solvents or water to the paint vessel to prepare the paint for application. During the operation of the painting machines, these workers tend the equipment, observe gauges on the control panel, and check articles for evidence of any variation from specifications. The operator uses a manual spray gun to "touch up" flaws.

d) Powder Coating

Powder coating is another common technique for painting manufactured goods. Powder coating machines achieve a smooth finish on metal objects. Workers oversee machines that electrically charge the metal object so that it acts like a magnet. The object enters a powder room filled with powdered paint that is attracted to the magnetic object. After being covered in the powder, the object is baked in an oven where the paint melts into a smooth paint finish.

11.3.4 Integrated pest management Managers

Integrated pest management is popular for several reasons. Pesticides can pose environmental and health risks and some States heavily restrict the application of pesticides. Some pests are becoming more resistant to pesticides in certain situations. Finally, an integrated pest management plan is more effective in the long term than use of a pesticide alone. New technology has been introduced that allows pest control workers to conduct home inspections, mainly of termites, in much less time. The technology works by implanting microchips in baiting stations, which emit signals that can tell pest control workers if there is termite activity at one of the baiting stations. Workers pick up the signals using a device similar to a metal detector and it allows them to more quickly assess the presence of termites. Most pest control workers are employed as pest control technicians, applicators, or supervisors. Position titles vary by State, but the hierarchy-based on the training and responsibility required-remains consistent.

Case Study of Fluoride Poisoning

Village where people never smile

The young men and women of Karinde hardly laugh. When you strike a conversation with them, they cover their mouths with their hands or simply look away. Most of the residents in Dagoretti have brown teeth but that is not all. Most of them, including the youth, complain of joint pains and fatigue even though they do not do hard labour. The old walk slowly as if burdened by work. "These people are slowly wasting away," says Mr Francis Wainaina, a community worker with Millennium Community Development Initiative.In 1986, there was a Government initiative to sink boreholes in the area. After the project was complete, an engineer took samples for testing and returned with the verdict that the water was unfit for consumption as it contained high amount of fluoride. The then water project chairman Pius Mbatia took a sample to Deflorisation Filters Centre, Nakuru, and returned with pictures of deformed people.

Judy Mukuria and Evelyn Wanjiru. You meet a young man who admires you and engages you in a conversation. But the moment you laugh, he looks for an escape route.

Photos: Kiundu Waweru/Standard

"He was told that that was how we would look if we continued using this water," says Mr Geoffrey Mubinu, the Karinde Water Project chairman. "That was in the early 1990s when the main source of water was Gitwe Kia Mbagathi, about a kilometre away."

High fluoride

Wainaina also took a sample of the water to Kenya Water Institute for analysis. Tests showed the water contained high levels of fluoride – about 3.85mg/L – which is higher than the recommended optimum level. But trips to the river were tiring and the villagers did not want to hear about going back there, says Maendeleo ya Wanawake chairperson Jacinta Kago.Residents continued using the borehole water. With time every home had piped water. The bill was minimal, affordable. Residents paid only for maintenance.But the opportunity cost was heavy. All the children born after the boreholes were dug had brown teeth. Today, the people wish they had listened to warnings. During a free medical camp in December last year the number of people with arthritis amazed doctors.Mr Peter Muigai Njau, 24, who has arthritis, carries painkillers wherever he goes."I wake up numb in the morning. To do anything, I must first exercise my muscles. I cannot work for long periods."

Safe water

Muigai's story is similar to that of many others in this village. Men in their 50s and 60s use walking sticks. "Karinde might be wiped out as children are born with this curse deep in their bones," says Ms Pauline Wangari.Ms Judy Mukuria, slim and pretty women in her early 20s, has lost six teeth. But that is not all. "You meet a young man who admires you and engages you in a conversation. But the moment you respond, or laugh, his facial expression changes and he looks for an escape route," says the 24-year-old.Too much fluoride causes discolouration of teeth, known as dental fluorosis and brittleness. "When taken in large quantities the enamel is totally broken down," says Dr Gladwell Gathecha, a dentist who did the analysis.Prof Henry Thairu, chairman of Radiation Protection Board, says high levels of fluoride affect bones and teeth. "Continued consumption of water containing high quantity of fluoride affects people's health and more so children whose bones are still developing," says Thairu

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11.4 Information to Workers to Protect Their Health and Safety Of Chemicals

Applicators that specialize in controlling termites are called termite control technicians. They use chemicals and modify structures to eliminate termites and prevent future infestation. To treat infested areas, termite control technicians drill holes and cut openings into buildings to access infestations and install physical barriers or bait systems around the structure. Some termite control technicians even repair structural damage caused by termites. Fumigators are applicators who control pests using poisonous gases called fumigants. Fumigators pretreat infested buildings by examining, measuring, and sealing the buildings. Then, using cylinders, hoses, and valves, they fill structures with the proper

amount and concentration of fumigant. They also monitor the premises during treatment for leaking gas. To prevent accidental fumigant exposure, fumigators padlock doors and post warning signs.

11.5 Legislation that Promote awareness of workers and the Public

11.5.1 Role of Occupational Safety and Health Act (OSHA)

The Occupational Safety and Health Act, 2007 (OSHA) enacted by Parliament in 2007 provides for the safety, health and welfare of workers and all persons present at workplaces, and provides the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Department Of Occupational Health and Safety Services under the Ministry of Labor, enforces the Act and ensures all workplace annual audits required by OSHA are conducted where issues of chemical safety are addressed. Under the OSH Act:

- The Director of the Department Of Occupational Health and Safety Services (DOHSS) after consulting with the National Council for Occupational Safety and Health establishes safety and health requirements based on risk assessments, technical standards and medical opinion, for the safe handling and transportation of chemicals and other hazardous substances.
- An employer shall not require or permit his employee to engage in the manual handling or transportation of a load which by reason of its nature is likely to cause the employee to suffer bodily injury.
  Any person supplying, distributing, conveying or holding chemicals or other toxic substances shall ensure that they are packaged, conveyed, handled and distributed in a safe manner so as not to cause any ill effect to any person or the immediate environment.
- At every workplace where chemicals or other toxic substances are manipulated, the employer shall develop a suitable system for the safe collection, recycling and disposal of chemical wastes, obsolete chemicals and empty containers of chemicals to avoid the risks to safety, health of employees and to the environment.
- Every occupier shall establish a safety and health committee at the workplace in accordance with regulations if— (a) there are twenty or more persons employed at the workplace; or (b) the Director directs the establishment of such a committee at any other workplace.
- The occupier of a workplace shall cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor. The audit report can have issues of chemical safety addressed in the work places. This audit is to be shared with workers and stakeholders.

Figure 11.1 Unsafe Dumping of Obsolete Chemicals in Menengai Crater in Nakuru

11.5.2 The Work Injury Benefits Act, 2007

Is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. The Minister in charge of labour

enforces this Act with the Director of Work Injury Benefits receive reports of accidents and carry out investigations into such accidents and ensure that employees who are injured are compensated in accordance with the provisions the Act. The Second Schedule of the Act contains the details of occupational diseases which can occur after handling various chemicals in solids, liquid and gaseous form the list is quite comprehensive. DOHSS advises on the criteria for quantifying this. It also details the rate of compensation for various injuries arising from chemical accidents.

11.5.3 Radiation Protection Act Cap. 244

This Act makes provision for the protection of the public and Radiation Workers from the dangers Arising from the use of devices or material capable of producing ionizing radiation. It is enforced by the Minister in charge of public health .An obvious risk exists in irradiation of foodstuffs mostly used for preservation. Sometimes this may exceed the levels allowed. Therefore all foodstuffs and other substances that come into Kenya are monitored for possible eradication and contamination. Additionally there is a program for a country -wide monitoring of radiation from natural sources by the Radiation Board. All information generated is confidential and is not readily released to other parties without a fairly tedious process. Information is made available to the public concerning the risks posed by chemicals to the environment, health and safety, and actions which should be taken for self-protection from chronic or acute exposure to hazardous chemicals.

11.5.4 EIA and Audits

The government endeavors to forward substantial and convincing information to all interested institutions, mass media and citizens through press conferences, press statements, media discussions, active co-operation in domestic and international meetings, symposia and congresses, through publication of booklets and through, Internet, and direct contacts with the interested parties. Some organs provide information in bulletins or journals such as "Environment and Space" bulletin published by the Ministry of the Environment and Physical Planning. It is distributed in over 1500 copies to ministries, local authorities, NGOs and international organizations.

The EMCA of 1999 requires the EIA be advertised in the print Media for members of public to comment on them before approval is given by NEMA in many occasion such advertisements are prominently displayed in the print media. Appendix 1 .EMCA has mechanisms for appeal, NEMA Appeal Council, where aggrieved members of public can take their issues but requires publicity for members of public to appreciate and access justice on environmental matters. Since 1990 in Kenya the number of environmental protection and natural protection non-governmental organizations (NGOs) has been increasing rapidly, so that in January 1997 there were more than 100 such organizations.

- The Information concerning environmental conditions and changes, the procedures and activities of bodies of the State and Local Authorities, of the parties involved in the delivery of public services, and those with public authorization relating to the environment, shall be open to the public.
- The parties of the preceding paragraph shall inform the public and provide information to interested individuals and organizations in the prescribed manner not later than one month after the request for such information and at a price which may not exceed the material costs of providing the information.
- Any party whose business operations should in any way or form strain the environment shall provide public access to the information concerning such environmental strain as they may cause in the manner specified in the preceding paragraph through the competent department of Local authorities referred to the paragraph 3 of Article 92 hereof.

11.5.5 Participation of NGOs

The NGOs function at the local, regional, national and international levels. The scope of activity of NGOs is contextually very wide, covering all activities important for the environment, particularly education, upbringing and promotion of awareness; the drawing of the attention of government structures to environmental problems and proposing solutions; legislative initiatives; promotion of permanent development; participation in the monitoring of the state of the environment and nature, etc. MEMR together with NEMA and Attorney General Chambers should involve decision-makers and legislators in workshops, seminars and retreats that address environmental issues so that they appreciate issue of chemical safety and pass relevant legislation and regulations. Fig 9 shows session where herders are trained to select livestock protection chemicals in a safe way

Figure 11.2 Conducting Chemical Awareness among Rural People: source AAK

MEMR through NEMA and Ministry of Labour, (DOHSS) also do involve media owners association in planning meetings for workshops, seminars and retreats in which suitable personnel are nominated to participate on issues of chemical safety and environment in general. This would improve the understanding of communicators and the media concerning chemical safety issues and encourage them to better communicate these issues to the public in order to improve understating and promote chemical safety actions by the public and civil society in general.

11.6 Education and Training for sound Management of chemicals and waste.

Because of this many industries now have health and safety committees and many now do have an Environmental Health Safety (EHS) Officer after the requirement by the Factories and other places of work Act. Many training workshops mainly sect oral have been concluded especially for the oil, horticultural, livestock and other sectors. Much of the training people receive is during their secondary education and sometimes also university if they are doing science oriented subjects

a) **Develop Chemical Safety Education in Schools and University Curricular**

MEMR and NEMA, Ministry of Education, Kenya Institute of Education (KIE) and the public universities should form a taskforce for development of Curricular on chemical safety. Fig 111.3 Technical training

b) Promote the necessary skills for administrators concerned with risk assessment and regulations in the use of available data and evidence base approaches.

MEMR and NEMA, Ministry of Labour, Kenya Institute of Administration should organize training and workshops for the administrators

c) Promote skills training for a number of professional workers concerned with aspects of sound management of chemicals to the users of chemicals, such as agricultural and industrial workers and those in SMEs. MEMR and NEMA, Ministry of Finance, KRA, Ministry of Industrialization, Ministry of labour KAM should organize training or short courses through established institution like KRA training Institute, Department of Industrial Training (DIT), and Kenya Industrial Research Institute (KIRDI).
d) Promote the training of health and other professionals in diagnosis and management of exposed persons. MEMR and NEMA, Ministry of Public Health and Sanitation, Ministry of Medical Services, KMTC and Universities should develop and include a chemical safety courses at KMTC and Medical schools
e) Promote the training of chemical emergency response professionals. MEMR and NEMA, Ministry of Public Health and Sanitation, Ministry of Medical services, KMTC, Red Cross, St. Johns ambulance and local authorities should enhanced training on their personnel involved in emergency responses and include other health-care workers.
f) Promote the training of staff at technical facilities, such as laboratories, recycling initiatives, and disposal facilities.
g) GCD, KEBS, NEMA, KIRDI, KAM, DIT, KAM, PCPB, industries involved in recycling, should organize such training for staff in their places and assist other organizations where capacity is limited

11.6.1 Recommendations To Address Shortcomings In Awareness.

The following recommendations are made to address the shortcomings of workers, the public and vulnerable groups.

- Incorporate a system of health and environmental impact assessment as a requirement for handling chemicals in general especially for small scale holders.
- Integrate chemical safety issues into poverty reduction strategies, development plans and environmental management programs at local and national levels.
- Train a pool of experts to deal with issues of Class I and II chemicals using the bottom up approach.
- Establish roles and responsibilities of employers, employees, chemical suppliers, and the government to protect those that deal with chemicals.
- Strengthen legislation to protect the health of workers in sectors where chemicals are handled e.g. health and agriculture.
- Identification, assessment and control of occupational chemical risk factors in workplaces.
- Avoid excessive or inappropriate supplies of chemicals in in donor assistance activities for chemicals.
- Regularly take inventory of types and volumes of chemical imported in the country and generate information on potential exposure and means to minimize it.

- Prohibit or restrict availability and use of acutely toxic chemicals to vulnerable groups[1].
- Substitute where applicable, acutely toxic chemicals with those chemicals with reduced risk and/or non-chemical alternatives at agricultural and informal sectors.
- Encourage/reward voluntary withdrawal of acutely toxic chemicals by enterprises in Kenya.
- Avoid the build-up of stocks and dispose of stockpiles that are no longer required using the best available technologies and practices.
- Commit stakeholders to sharing information on options for effective action to protect children and communities from chemical exposures, threats and risks.
- At the workplace, there is need to develop and implement relevant approaches, standards, and guidance materials for recording, collecting, and analyzing workplace data.
- Provide and share information on chemicals, and chemical safety in the workplace in forms and languages suitable and convenient to the workplace participants, including employers, employees and government.
- Ensure that product label statements have clear safety and use information.

11.7 Comments/analysis

Today, the open and authentic nature of information forwarded to the public and workers is a fundamental goal of the authorities dealing with chemicals. There exist limited capacity in Kenya in relation to workers awareness and public awareness concerning chemical safety issues but the capacity is not well and widely developed hence not used optimally. It should be enhanced. The capacity should be fully optimize and exhausted to ensure any outside help is well targeted and effective to.Further training and improved public information is still required in the field of chemicals management. NGOs should get more training in the fields of chemical safety, risk assessment, and interpretation of laboratory and field data. The public should be better informed about the potential risks of hazardous chemicals and should learn how to avoid such risks. It should also have online access to chemical databases and information about chemicals. The MEMR and Ministry of Health should be more open to the public ensuring access information about chemicals at locations convenient to the public.

12 CHAPTER 12: INTERNATIONAL LINKAGES

12.1 Cooperation and Involvement with International Organizations

Chapter 19 of Agenda 21 dealt with chemical safety as then perceived, although it did not fully consider it in the context of other potentially related areas, such as wastes, development assistance, and sustainable production and consumption.

Increasing globalization of trade and the enormous market for chemicals and the products they are used in means that chemical safety programmes must be strengthened and steps taken to place them in the mainstream of sustainable development concerns. Such an approach should, inter alia, provide a policy and procedural framework for addressing both ongoing and emerging issues of international concern, as well as helping to interweave policy, coordination and sustainable development objectives as the ultimate goal of chemical management.

Table 12.1 Membership in International Organizations, Programmes and Bodies

International Organization/ Body/activity	National Focal Point	Other ministries/agencies involved	Related National Activities
IFCS	MOPHS-GCD	MoL, MEMR	Raise occupational health and safety issues
IPCS	DG- NEMA	MoL	Registration of chemicals
WHO	MoMS, MoPHS	MoF, MWI	Health TB
FAO	MoA	MoF, MoT, MEMR	Provision of reference Material in Food and Agriculture activities • Implementation of FAO Code of Conduct.
ILO	MoL	MoPHS	Workers safety
UNEP IE/PAC-Cleaner Production	MEMR, (KIRDI)		Cleaner production practices • advisory services to industry and ensuring their provision to companies
UNIDO	PS MoI	MoT	Promotion of industry
World Bank	Ministry of Finance	All ministries	Financing
African Development Bank	Min. of Finance		Financing
East Africa Community	Ministry of East Africa community		Political cooperation
COMESA	Min. of Trade	Min. of Finance	

12.2 The Johannesburg Plan of Implementation

The Johannesburg Plan of Implementation adopted by the World Summit on Sustainable Development on 4 September 2002, and subsequently endorsed by the United Nations General Assembly, gave strong support to international efforts in the area of chemicals and hazardous wastes.

The harmful substances and hazardous wastes have potential to cause adverse impact on environment and human health. These include:

i. Persistent, bioaccumulative and toxic substances (PBTs);
ii. Chemicals that are carcinogens or mutagens or that adversely affect the reproductive, endocrine, immune, or nervous systems;
iii. Chemicals that have immediate hazards (acutely toxic, explosives, corrosives);
iv. Chemicals of global concern such as persistent organic pollutants (POPs), greenhouse gases and ozone-depleting substances (ODS)
v. Healthcare wastes, and
vi. E-wastes.

UNEP has facilitated the negotiations of a number of international treaties on chemicals and waste, and hosts the secretariats of:

- Basel Convention on the trans boundary movement of hazardous waste and their disposal
- Montreal Protocol on Substances that Deplete the Ozone Layer.
- Vienna Convention for the Protection of the Ozone Layer
- Rotterdam Convention
- Stockholm Convention
- Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. In addition there are health related agreements that relate to chemicals.

12.5 Measure Already Take to Implement JPOI

To address commitments to international obligations, there were specific targets such as outline below:

(a) Encourage countries to implement the new globally harmonized system (GHS)of classification and labeling of chemicals as soon as possible with a view to having the system fully operational by 2008. The initiative for GHS has not taken off in Kenya although the deadline is already.

(b) Encouraging partnerships that promote activities aimed at enhancing environmentally sound management of chemicals and hazardous wastes, implementing multilateral environment agreements, raising awareness of issues relating to chemicals and hazardous waste and encouraging the collection and use of additional scientific data promoted by MI&T, KIRDI, KAM.

(c) Promoting efforts to prevent international illegal trafficking of hazardous chemicals and 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, such as the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal; The Kenya Ports Authority and NEMA are implementing this.

(d) Encourage development of coherent and integrated information on chemicals, such as through national pollutant release and transfer registers through EMCA; The SAICM Quick Start Project is endeavoring to do this.

(e) Promote reduction of the risks posed by heavy metals that are harmful to human health and the environment such as the Dakar Plan of Action on phasing leaded petrol from Africa. Lead has been phased out in petrol. In paints, efforts need to be made.

(f) Reduce respiratory diseases and other health impacts resulting from air pollution, with particular attention to women and children, by implementation of standards and guidelines on air pollution: Draft standards have been formulated awaiting ministerial approval.

(g) Supporting the phasing out of lead in gasoline; Phase out lead in lead-based paints and on other sources of human exposure, work to prevent, in particular, children's exposure to lead and strengthen monitoring and surveillance efforts and the treatment of lead poisoning.

The multilateral Environmental Agreements on Chemicals That Kenya Is Active Include:

i) The Rotterdam convention on the Prior Informed Consent Procedures for chemicals and Pesticides in International Trade(In short Rotterdam Convention on PIC),

ii) The Stockholm Convention on persistent organic pollutants was ratified on 24th September, 2004. It came into force for Kenya in September 2007.

iii) The Basel Convention on the Trans-boundary Movement of Hazardous Wastes and their Disposal entered into force in September, 1992. The Third conference of Parties held in 1995 dealt with the control and banning of abusive Tran boundary movement of hazardous wastes. The Ban Amendment prohibits exports of hazardous wastes from the OECD, European Union and Liechtenstein to all other countries. Kenya has ratified the Ban Amendment.

iv) UNEP provides the secretariats for the Stockholm Convention and Basel Convention and, jointly with the Food and Agriculture Organization of the United Nations (FAO), for the Rotterdam Convention. These secretariats, as well as UNEP support for these treaties, fall under the umbrella of UNEP Chemicals, which is also in close cooperation with the secretariat of the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal. Kenya hosts the Vienna Convention on the Protection of the Ozone Layer and its Montreal Protocol on substances that deplete the Ozone Layer.

v) Kenya has taken a keen interest in the chemical work of UNEP as well as the GEF which has many programs for the sectors of climate change, ozone layer protection, pesticides, industrial chemicals and POPS in particular

Major initiatives initiatied by international programmes include:

1. Kenya Participated which made long term decisions on strategic approach to international chemicals management
2. CSD 18 Kenya Participated which made wide ranging policies on global c chemicals and waste management
3. Approval of SAICM QSP Pilot Project for Gabon and Kenya to implement Libreville Declaration on Environment and Health
4. Publication of the WHO document on Public Health and the environment in the African Region
5. 2nd African Interministerial Conference on health and environment linkages

- Enacting of the new constitution in July 2007 which gives strength to those international agreements Kenya is signatory to.
- Development of draft Regulations on chemicals By NEMA
- Circulation of Draft Guidelines on e-waste by NEMA
- Draft of the integrated Solid waste Management Project for Nairobi
- Sanitary Landfills approved for Nakuru, Mombasa counties
- Ist Report of the Kenya Coordinated Global POPS Monitoring Project at UON
- Implementation of the on project illegal trade on chemicals

- Designation of ICIPE as a regional Centre for Transfer of Technology under the Stockholm Convention
- Increasing ISO 14000Certyfication of Analytical Laboratories namly KEPHIS, KARI, KEPs which all analyse POPs

Table 12.A lists details of multilateral environmental agreements to which the country is signatory

12.3 Outline of Key Conventions

The following is a brief outline of the key multilateral agreements on chemicals and wastes that Kenya is Party to and are coordinated by this Ministry;

12.4 Rotterdam Convention

In conjunction with these considerations, the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade demonstrates the commitment of FAO and UNEP to address challenges associated with highly hazardous and other pesticide use in Kenya and other developing countries. Information available on banned or severely restricted pesticides under PIC helps strengthen national decision making on pesticides. The PIC procedure assists countries like Kenya in avoiding imports of hazardous chemicals that they cannot manage safely under national conditions of use. As such, the Convention helps to prevent incidents before they occur, serving as an early warning system or first line of defense, internationally, that helps keep countries apprised of actions that are being taken by other countries in dealing with problematic chemicals.

These and other efforts, internationally, provide a framework for strengthened pesticide and other chemicals management actions on the ground, in countries such as Kenya.

12.4.1 SAICM

SAICM was developed in February 2006 as the global instrument to help countries reach the goal agreed at the World Summit on Sustainable Development that by 2020 chemicals are produced and used in ways that do not pose risk to humans and the environment. It is to bring harmony and order in the way that the United Nations agencies implement the conventions and other agreements on chemicals in relation to their environmental and social impacts. Its implementation is coordinated by UNEP and the International Labor Organization.

12.4.2 The Rotterdam PIC Convention

This Convention principally provides parties to have a say and control in accepting or rejecting chemicals import into their countries. There are currently thirty three (33) Controlled chemicals which are subject to routine Prior Informed Consent Procedure under this convention. However each country has the discretion to add more. Thus, Kenya has developed its Controlled and Restricted Chemicals List under the Pest Control Products Board (PCPB). A list for industrial chemicals is under consideration under the EMCA regulations.

12.4.3 The Stockholm Convention

The convention is to assist to phase out some nine (9) pesticides (aldrin, dieldrine, DDT, hexachlorobenzene, mirex, toxaphene, two industrial chemicals (PCBs) and minimize unintentionally produced by products namely dioxins and furans which emanate from combustion processes Kenya became party to the convention in 2004 and finalized its implementation Plan(NIP)

in March 2007[1]. Of the pesticides, Kenya has banned seven (except mirex). DDT use is being restricted to public health use though it is not used due to public pressure. PCBs a used to be imported for transformers and are not imported anymore. Dioxin and furans are generated from open burning of waste, residential burning and recycling of waste. This is the major source of POPs for Kenya.
FAO's mandate in this field includes the prevention and management of pests, the appropriate distribution and use of pesticides including their disposal as governed by the International Code of Conduct on the Distribution and Use of Pesticides, and the control of international trade in 44 SAICM, Overarching Policy Strategy, [Overall] Objective, para. 13, based on the 2020 goal/target agreed by the global community as part of the 1992 World Summit on Sustainable Development's Johannesburg
Plan of Implementation, para. 23. particularly hazardous pesticide formulations as governed by the Rotterdam Convention on Prior Informed Consent.

In this context AGPP has worked with the Government of Kenya to eliminate stockpiles of obsolete pesticides and strengthen institutional capacity in the areas of pesticides management and hazardous waste management.In addition, the AGPP provides guidance on Integrated Pest Management (IPM) which is able to reduce reliance on chemical pesticides. IPM increases the sustainability of farming systems and improves ecological sustainability, as it relies primarily on environmentally benign processes including the use of pest resistant varieties, the actions of natural enemies and cultural control. Finally, IPM programmes are economically sustainable as they reduce farmers' dependence on procured inputs. IPM addresses far more than purely pest management, offering an entry pointto improve the farming system as a whole.

12.4.4 Basel Convention on hazardous waste

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal entered into force in 1992. It is concerned with the annual world-wide production of hundreds of millions of tonnes of hazardous wastes. These wastes are considered hazardous to people or the environment when they are toxic, explosive, corrosive, flammable, eco-toxic, or infectious.

The Convention regulates the movement of these wastes and obliges its members to ensure that such wastes are managed and disposed of in an environmentally sound manner. Governments are expected to minimize the quantities that are transported, to treat and dispose of wastes as close as possible to where they were generated, and to minimize their generation at source.
Currently it has 188 parties showing its wide global acceptance.

The Environment Management and Coordination Act as well as Waste Regulations gazetted in December, 2006 closely borrowed from the Basel Convention;
During the negotiating process for the convention, the position of many African states was guided by the decision of the Dakar Ministerial Conference on Hazardous Wastes held in January 1989 at which a total ban on imports of hazardous wastes into African countries was called for. However, Africa recognized that enforcement would need further consideration due to Africa's lack of technical capacity. This gave rise to the Bamako Convention on the Ban of export on Hazardous waste to Africa. Though the Bamako convention received the required number of ratifications to enter into force, it has not done so due to lack of finances.

Therefore, because of a sustained push by African Governments, the Basel Convention was amended in April, 1999 banning the export of wastes from the Organization for Economic Cooperation and Development countries (OECD) and Lichestein to developing countries. This Amendment is to be ratified to enter into force.

[1] Kenya National Implementation Plan for the Stockholm Convention http://www.pops.int/implementaion/nips

12.4.3 Domestication of the Conventions.

For implementation at national level, the (EMCA) establishes a legal framework for the management of pesticides, toxic and hazardous chemicals adopting a precautionary approach. EMCA deals more comprehensively with all the conventions widely listing of chemicals. It establishes standards of emission and discharge for hazardous chemicals and chemical wastes from industrial processes, photographic processes, surface treatment of metals and wastes from the petrochemical industry among others.

12.4.4 Synergies.

At international and local level, implementation of the conventions has also generated conflict and contradictions.

The secretariats of three global conventions (Rotterdam Convention, Basel Stockholm Convention,) though their operations are largely, covered from UNEP's Environment Fund in response to UNEP Governing Council Decisions. Their Secretariats are based in Geneva Switzerland except for the Montreal Protocol which is based in Nairobi. Their conference of Parties meets at separate times and generally has diverse programs. However they also have common elements and could benefit from synergies of technical capacity, funding and coordination. UNEP Governing Council has therefore directed that each COP find ways and means of promoting this synergy. For this reason the Conference of Parties of each of the convention has contributed to a joint working group to discuss how synergies between the three conventions can be enhanced. The group that is Basel Convention will report to the COP 9 Meeting in Bali this June.

Table 12.2 Participation in International Agreements/Procedures Related To Chemicals Management

International Agreements	**Primary Responsible Agency**	**Relevant National Implementation Activities**
Agenda 21 - Commission for sustainable Development	MEMR	Development of relevant policies and legislation Coordination of MDGs
Stockholm Convention On POP	PS Ministry of Environment & Mineral Resources	Implementation of NIP
International Convention for the Prevention of Pollution From Ships, London, 1973.	Kenya Ports Authority	Pollution Control at Sea
Basel Convention on The Control of Transboundary Movements of Hazardous Wastes	PS =MEMR-NEMA	Receiving notifications, capacity building
Chemical weapons convention	MoPHS- (Government Chemist)	Domestication/legislation Implementation/Declarations
UNEP Rotterdam Convention on PIC	Designated National Authority; NEMA MEMRDNA(2) MOA- PCPB	• Establishing PIC procedure in • Establishment of National import decision on some PIC chemicals (Industrial and consumer chemicals)
UNEP London Guidelines	PCPB –pesticides NEMA-chemicals	Implementation domestication
Montreal protocol on ODSs	Ministry of Environment and Mineral resources	Implement the ratified regulations (ODS)
ILO Convention 170	Ministry of labour	
Chemical weapons convention	Government Chemist	Domesticating and Implementing the convention
Ramsar Convention on Wetlands	Ministry of forestry and wildlife (KWS)	Protection and conservation of wetlands
EAC	Ministry of East Africa community	Control of illegal traffic
GATT/WTO agreements	Min. of Trade	Banned and restricted substances
London Convention	Kenya Marine Authority	Marine Pollution Control
Kyoto protocol	Ministry of Environment & Mineral Resources	Participation in the carbon market

Table 12.3 Multilateral Environmental Agreements to which The Country is Signatory

Item	Title of Convention / MEA	Existence of a NIP	Existence of Focal Point	Existence of Mechanism to Enhance Compliance	Status of NIP Implementation	Technical Resources	Source of Funds	Proportion of GoK Funding
1.	Rotterdam Convention On Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam, 1998[39]	Daft Action plan	Yes (2 DAs; NEMA & PCPB)	No (Draft Regulation)	ongoing	none	UNEP /GoK*	Nil
2.	Stockholm Convention On Persistent Organic Pollutants (2004)[40]	Yes	Yes (MEMR)	No (Draft regulations)	Partial	Yes (limited)	Gok *	10%
3.	United Nations Framework Convention On Climate Change (2005)[41]	Yes	Yes (MEMR)	None	ongoing	Yes (various)	Gok *	90%
4.	Kyoto Protocol to the United Framework Convention on Climate Change (1998)[42]	No	Yes (MEMR)	No (Draft Regulation)	ongoing	none	Bilateral/GEF /GoK*	
5.	World Health Organisation Framework Convention on Tobacco Control, Geneva 2003[43]	No	Yes (MOPHS)	Yes	Partial	Yes (various)	Blooberg/ WHO/ GoK*	20%
7.0	Convention for the Protection, Management and Development of the Marine and Coastal Environment of the	Yes	Yes (NEMA)	ongoing	Ongoing	yes	GoK	100%

[39] www.pic.int
[40] www.pops.int
[41] www.unfcc.int
[42] www.unfcc.int/protocol
[43] www.who.int

Item	Title of Convention / MEA	Existence of a NIP	Existence of Focal Point	Existence of Mechanism to Enhance Compliance	Status of NIP Implementation	Technical Resources	Source of Funds	Proportion of GoK Funding
	Eastern African Region, Nairobi[44], 1985							
8.0	Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985	Yes	Yes (MEMR)	Yes	Ongoing	yes	GoK*/WMO/ GEF/ WHO	10%
9	Montreal Protocol on Substances that Deplete	Yes	Yes (MEMR)	Yes	Ongoing	Yes	GoK/UNEP GTZ/ MEA Ozone funds	
10	International Convention for the Prevention of Pollution From Ships, London, 1973	Yes	Yes (Kenya Ports Authority)	Yes	Ongoing	Yes	GoK*/IMO	10%
11	Basel Convention on	Yes	Yes (MEMR)	Yes	Ongoing	Yes	GoK*/UNEP	10%
12	Bamako Convention on the Ban of the Import Into Africa	None	None	none	none	None	none	Nil
13	Abuja declaration on rollback malaria strategy	Yes	Yes (MOPHS)	No	Ongoing	Yes	GoK*/WHO/ PMI/GF	20%
14	C187 Promotional Framework for Occupational Safety And Health Convention, 2006	No	Yes (DOHSS)	Yes	Partial	Partial	GoK*/WHO/I LO	NIL
15	International Health Regulations (2005)	No	Yes (MOPHS)	No	No	Yes	GoK*/WHO/ CDC	10%
*	Refers to printed estimates 08/09 and/or contribution in kind							

[44] www.unep.org/

12.4.5 Financing Chemical Programming

The chemical conventions and waste having been negotiated at different times and targeting different clusters of chemicals operate independent conference of Parties, bureaus and secretariat. They have a common thread of addressing technical and financial assistance as well as monitoring and research. All negotiations of implementation generally rotate around how countries can cooperate in these areas.

a) Financing.

Of the above conventions, only the Stockholm Convention has a financing mechanism to support the implementation. Kenya has finalized its NIP and capacity building Project Proposal which will be submitted soon to the GEF.

The Basel Convention has a voluntary Trust Fund to support transfer of technical assistance to developing countries but it is highly underfunded. For example in 2006 this trust fund had US$450,000 for biennium program for all developing countries. The SAICM has what is called Quick Start Program where countries can benefit from a support of a maximum of US$250,000 to support its implementation. Kenya has applied and got this support. An implementation agreement is being developed with UNITAR

12.4.2 United Nations Agencies Involved in Financing

All these conventions have their Secretariat based in Geneva Switzerland except for the Montreal Protocol which has its Secretariat in UNEP, Nairobi-Gigiri Internationally chemicals are by the following United Nations specialized agencies:

- Food and Agriculture Organization (FAO) for Agrochemicals
- World Health Organization (WHO), Vector Control Insecticides
- United Nations Environment Programme(UNEP) for training and research;
- United Nations Industrial Development Organization (UNIDO), for Industrial Chemicals and services
- United Nations Development Programme (UNDP) for chemical use policies and development issues
- Global Environmental Facility for financing the POPs and
- UNEP for ozone Depleting Substances (ODS) Montreal Protocol.

12.5 Participation in International Agreements

Environmental effects range from effects on sensitive species / ecosystems, to large scale issues such as eutrophication of water bodies and stratospheric ozone depletion. Chemicals contamination is wide spread both on land and in water. People are exposed through occupational activities as well as in daily life through intake of contaminated drinking water, ingestion of contaminated food (e.g. fish contaminated with mercury, DDT and/or PCBs), inhalation of polluted air (outdoor as well as indoor), and through direct skin contact ..Kenya actively participates in most of the international multilateral agreements and procedures related to chemical management. The key conventional and procedures are summarized in table 12.3 below. Participation in Relevant Technical Assistant Projects.

Kenya actively participates in many of the international multilateral and bi-lateral Technical assistance activities related to chemical management. The key activities undertaken under various conventions and agreements are summarized in table 12C below.

Table 12.4 Participation in Relevant Technical Assistance Projects

Name of project	International/Bilateral Agency	National Focal Point	Relevant Activities
1. SAICM QSP	GoK/UNEP/UNITAR	PS -MEMR	• Develop National chemical profile • Capacity assessment • Inter-ministerial co-ordination of sound chemicals management
2.SAICM implementation in East Africa: law reform and	UNEP/QSP	ILIMA Kenya	• Assess the current legal frameworks • Develop training modules and ToT • Conduct a survey /research on SAICM implementation successes and failures
3. SAICM implementation of the Libreville Declaration	UNEP/WHO	WHO-Kenya country office.	• Develop situation analysis needs assessment(SANA) • Publish and disseminate Citizens Guide to monitoring and enforcement of chemicals laws.
4. Terminal phase out of CFC	GTZ	PS Environment	• Phase-out of CFC • Training of customs officers and technicians
5. Resource Efficiency & Cleaner Production (RECP);	UNEP	Director Cleaner production center	• monitors resource use in industries. • chemicals are assessed as a resource and all environmentally sound technologies (EST) are monitored for improvements.
BASEL Convention on Hazardous Waste	Basel Secretariat	MEMR	• Capacity for illegal transport
Reducing unintentional POPs (dioxins and furans) produced by the informal economy in Mombasa	GEF Small Grants Program	Director Eco-Ethics International – Kenya	1. Mapping out dioxins and furans hotspots and stakeholder inventory development 2. Public awareness and education 3. Capacity building and information exchange

12.5.1 Capacity Building for Chemical Safety in Kenya

The Kenya Government has an active interest to help stakeholders build their capacities to manage chemicals safely. The general approach is to provide awareness, legal and policy framework and training on key chemical safety issues. This is usually in support of the MEAs, then to follow up with institution or enterprise-based projects to help individual stakeholders integrate the training into their health and environmental protection programs. During 2002-2005 alone, MEMR organisedmany meetings and capacity-building workshops, bringing together Government departments, agricultural organizations, industry and other non-governmental organizations, to address chemical safety issues. These activities respond to the call for strengthening Kenya's capacity building in line with EMCA and promote SAICM.

12.5.2 Financing Chemical Management and GEF

UNEP GEF helped Kenya to develop her national implementation plan for Stockholm Convention through GEF-funded enabling activities, and NEMA is working with stakeholders to develop project proposals. These projects are part of a rapidly growing portfolio of GEF projects on persistent organic pollutants (POPs) and persistent toxic chemicals and Kenya needs to tap this to improve its technological and chemical safety programs.

The projects included activities t develop inventories of dioxin and furan sources and releases; develop polychlorinated biphenyl (PCB) inventories and management plans; identify stockpiles of obsolete pesticides; find and use alternatives to POPs pesticides; and participate in the chemical information exchange network as well as non chemical alternatives to chemicals such as DDT used in the control of mosquitoes breeding sites. Since then other projects on minimizing plastic waste, integrated solid waste management, etc. have been formulated and are being implemented.

12.5.3 Policy Development and Coordination with Development Partners

Many of the chemical and waste programs in Kenya are driven by MEMR with support from UNEP. UNEP is one of several international organizations active in the field of chemical safety, all of which offer distinct and complementary expertise in accordance with their respective mandates. UNEP works within the framework of IOMC, which was established in 1995 to coordinate efforts in the assessment and management of chemicals, and which currently has the following members: FAO, ILO, UNEP, United Nations Industrial Development Organization (UNIDO), United Nations Institute for Training and Research (UNITAR) and WHO. UNITAR provides leadership for the global environmentally sound management of chemicals, while other organizations provide leadership in chemical safety within their particular areas of specialization. To focus on international chemicals management they are jointly stream lining their approaches through the Strategic Approach to international chemical management.

12.5.4 Institutions

Many international organizations are helping for example, FAO is helping Kenya on pesticides and chemical inputs and it is the principal agent managing the African Stockpiles project which covers pesticide and waste under the Stockholm and Basel conventions.

i. **ILO** is active on matters related to workplace exposure while among the OECD; the GTZ of Germany is active in matters of ozone depleting substances.

ii. **UNIDO** has for a long term been a good partner to Kenya in the chemical industries sector and has been during the ODS phase-out as well as introduction of cleaner production methods.

iii. **The WHO** is guiding the debate on replacement of the DDT as part of implementing the Stockholm Convention especially with regard to addressing the present malaria.

iv. **UNITAR** has undertaken training in chemical profiles in Kenya and is particularly overseeing the implementation of SAICM QSP for Kenya

Particularly as a consequence of the establishment of the financial mechanism for implementing the Stockholm Convention, the World Bank and the United Nations Development Programme (UNDP) have recently become more active in the field of chemical safety, both in assisting countries with GEF-funded Stockholm Convention projects and in developing their own chemical safety activities with specific enterprises in Kenya so far they have not been identified with any specific chemicals program, but there is a desire to change.

12.6 Comments and Analysis

The Government of Kenya has supported bilateral and multilateral projects on chemicals and hazardous waste as detailed here below. Also Kenya has ratified most of the Multilateral Environmental Agreements (MEAs) on chemicals, which include the Stockholm Convention on Persistent Organic Pollutants, the Rotterdam Convention on the Prior Informed Consent procedure on chemicals and pesticides in international trade and Basel Convention on transboundary movement of waste, among others. Implementation ensures sound management of chemicals and hazardous waste hence reducing risks. Yet all over the world chemical risks continue to be a problem to nations. To address this concern, the Strategic Approach to International Chemicals Management (Saicm) was developed in February 2006, as the global instrument to help countries reach the goal agreed on at the WSSD, that by 2020 chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment. During the 1st International Conference on Chemicals Management (ICCM1) held in February 2006, Kenya joined the world in adopting SAICM. The Ministry of Environment and Mineral Resources is the focal point for SAICM.

13 CHAPTER 13: RESOURCES AVAILABLE AND NEED FOR CHEMICAL MANAGEMENT

13.1 Introduction

The purpose of this chapter is to provide an overview of resource availability and resource needs within the national government. Table 13.A addresses the existing resources available within government ministries and their agencies which deal with the management with chemicals. It includes information on the availability of professional personnel and particular skills, as well as financial resources. Table 13.2 addresses the resources estimated to be needed by the ministries and their agencies in order to fulfil their responsibilities in the field of chemicals man agement.

According to UNDP, capacity *b*uilding refers to the process by which individuals, groups, organizations, institutions and countries develop their abilities, individually and collectively, to perform functions, solve problems and achieve objectives. Thus c*apacity* building is not necessarily linked to external assistance activities. In relation to chemicals it refers to all efforts by governments, the private sector and civil society to achieve specific goals and perform certain functions to make progress in managing chemicals.

13.2 Resources Available and Needed in Government Ministries/Institutions

13.1.1 Needs for Capacity Building

When planning and implementing a capacity building project or activity, a key question is; what exactly is a project or specific activity meant to achieve i.e.("building capacity for what?") Which functions need to be performed (and by whom) to achieve a specific goal. Normal trainings on chemical safety normally covered include:

- Classification of chemical agents (dusts vapor, fumes gases, mist)
- Importance of Material Safety Data Sheets (MSDS)
- Mode of exposure to chemical agents;
- Overview of effects to chemical agents exposure;
- Control measures to chemical hazards exposure;
- Overview of effects to chemical agents exposure;

Goals requiring capacity building may be general, such as achieving the sound management of chemicals by the year 2020, as called for by the WSSD. Or, they can be more specific and pragmatic, such as:

- meeting the national obligations of a specific convention/protocol (e.g. the ILO Chemicals Convention; the Stockholm Convention; the Vienna Convention and its Montreal Protocol)
- a specific standard, such as the GHS, or a pesticide registration system.

Last, but not least, capacity building takes place - and progress must be measured - at the national, regional, and local levels as well as in the private sector and civil society. External support activities, such as those provided by IOMC Organizations, can only be facilitative and supportive in nature.

13.2.1 Human Resources

The majority of human resource capacity building involved in the management of chemicals is trained locally in the various tertiary institution including universities and polytechnics. These institutions are manned by highly trained staff including professors and lectures The fields of training include sciences, law, environmental management, health sciences and other relevant fields. A total of over 2000 students covering all these fields graduate every year and end up working in various sectors of

the economy with many of them being directly involved in chemicals management. Table 13A shows the key institutions, services offered and level of expert available.

Table 13.1 Resources Available in Government Ministries/Agencies

Institution	Specialized Services	Services Offered	Expertise Available
Ministry Of Water And Irrigation	Laboratory and analysis	Water quality data Water pollution data/waste water	BSc
Water Quality Laboratories	Advisory services	Water treatment technologies	BSc
Ministry of Labour	Data	Human exposure levels working environment data	BSc
DOHSS	Enforcement Inspection	Exposure Level Impacts of exposure	
Ministry of Industry	Data on chemical use	Imports use transport disposal	BSc, MSc
Kenya Industrial Research Institute	Data on Chemical use Research	Appropriate technologies New technologies	BSc, MSc, PHd
Kenya Bureau of standards	Data on standards Laboratory analysis	Standards ISO- certification Environmental levels	BSc, MSc, PHd
Ministry of Agriculture	Laboratory ,Extension services, training	Pesticide application Fertilizer and Agro chemicals Training and capacity building.	BSc, MSc, PHd
Ministry of Environment	Policy guidance ,Law and regulation	Coordination	Msc, Bsc, Phd
NEMA	Standards guidelines	Enforcement SERC	Phd, Msc, Bsc
Mines and Geology	Analysis of extraction	Analysis	Msc, Bsc
KMD	Analysis	Precipitation of So_2, Co_2	Msc, Bsc
Ministry of Medical services	Data Laboratory analysis	Poisonings Levels of pollutants	McB, Msc
Ministry of Public Health	Data Enforcement	Morbidity Data Pesticide Use Impact of pollutants	Bsc, Msc
Radiation Protection Board	Data and Enforcement	Radiation Levels	Bsc, Msc
Government Chemist	Analysis and Enforcement	Forensic Data on contamination	Bsc, Msc
National Public Health Laboratories	Laboratory analysis	Contamination	BSc, MSc
Water quality and research laboratopries	Water Quality Analysis	Research and enforcement	Bsc,Msc and Phd

Table 13.3 Research Institutions

Institution	Specialized Services	Services Offered	Expertise Available
Kenya Medical Research Institute	Laboratory analysis Research	Human exposure Environmentally sound disposal practices	BSc, MSc, PHd
Kenya Agriculture Research Institute	Laboratory training Field trials	Residue levels persistency efficiency	BSc, MSc, PHd
Pest Control Product Board	Inspectorate Registration	Restricted and Banned list Extension services	BSc, MSc,
Ministry of finance	Incentives and disincentives	Zero rating Financial management	BSc, MSc, Phd
Kenya Revenue Authority	Data enforcement	Imports/ Exports Custom coding,GHS	BSc, MSc,
Ministry of Education	Capacity Building	Training Curricular	BSc, MSc, PHd
Teacher Training College	Capacity Building	Curricular Extension services	BSc, MSc,
Nairobi University	Training analysis Research	Pesticides Residue Measures Undergraduate, Post graduate, doctorate and post doctorate	BSc, MSc, PHd
Jomo Kenyatta University of Agriculture	Capacity building	Incorporating chemicals in the environment	BSc, MSc, PHd
Kenyatta University	Training/capacity building		BSc,MSc, PHd
Moi University	Training Research	Pollution of Aquatic ecosystem	BSc, MSc, PHd
Ministry of Fisheries	Aquatic Pollution	Monitoring of Aquatic environment	BSc, MSc, PHd
Kenya Marine Fisheries Lake Victoria	Aquatic Pollution Research	Monitoring of pollutants Research into persistence	BSc, MSc, PHd
Kenya Marine Fisheries coastal	Marine Pollution	Monitoring of marine pollution for all parameters	BSc, MSc, PHd
Ministry of Energy	Data on imports of petroleum products Transport Gaseous emission	Types and quantities of petrochemicals Geothermal gases	BSc, MSc, PHd
Kenya Power Generating Company	Imports of oil	Geothermal emission	BSc, MSc, PHd
Ministry of Transport	Railway Marine Road transport	Emergence preparedness	BSc, MSc,
Kenya Ports Authority	Data in fracture	Imports and exports oil pollution contingency plans.	BSc, MSc
ICIPE	Ecological Studies	Research	BSc, MSc, PHd
SGS	Verification services	Goods Verification Services	BSc, MSc
City Council of Nairobi	Environmental Monitoring	Environmental Monitoring of pollutants	BSc, MSc
Kenya Refineries	Petroleum Oil Processing	Processing of Oil products	BSc, MSc, PHd

13.3 Comments/Diagnosis

The ministries, are involved in specific chemicals management, employ a minimal number of staff, qualified for chemicals management. As it can be seen from Table 13.A, the amount of financial resources available for chemicals management at all government ministries is too low. Plans are made to strengthen the number of qualified staff and to improve training, particularly at the Ministry of Health, the Ministry of Labour, Education, the Ministry of Agriculture, Mines and Geology and the Ministry of Science and Technology. Qualified staff who could deal with ecologic problems is particularly needed at the Ministry of Environment. There is need for additional training on analysis of chemical traces in the environment, interpretation of results, health and environment risk assessment, and industrial risk assessment.

The existing research institutions that are doing commendable job for pesticides analysis and assessment of maximum residue levels in response to international trade and market requirements. In fact quite a number of institutions are doing well in the search for alternatives. For example the work done on the phase-out of methyl bromide as an ozone depleting substance in the Naivasha flower farms is commendable. Alternatives to toxic chemicals are being identified and commercialised. For research, the capacity assessment can be summarised as follows:

i. Kenya is in building capacity for research institutions to address societal problems such as the increasing causes of cancer and disease of genetic implications e.g. deformed cows goats and people
ii. Financing and coordination with the research institutions and
iii. Collaboration among the research institutions, Universities, industries and private sector involved in chemicals.

14 CHAPTER 14: CONCLUSIONS, RECOMMENDATIONS AND PRIORITIES

14.1 Conclusions

This National chemicals Profile is a comprehensive assessment of the national infrastructure relating to the legal, administrative and technical aspects of chemicals management in Kenya. It highlights strengths, gaps and identifies priority areas which could have the greatest immediate impact on chemicals risk reduction in Kenya. In its development, there have been active participation and contribution from key chemicals stakeholders' such as the government, civil society, industry, academia, research among others. They provided valuable input.

The following are key conclusions emerging from the profile on the status of chemical management in Kenya:

1. Kenya is not major manufacturer of chemicals except those that are locally mined and processed in country such as fluorspar, lead and titanium. The bulk of the chemicals used in the country are imported and mainly consist of petroleum, fertilizers, plastics, pesticides and consumer products. There is also significant importation of chemicals into the country of chemicals designated by international regulatory instruments as highly toxic. Evidently major chemical consumers in Kenya are agriculture, manufacturing and service sectors.
2. The key challenges pertaining to chemicals management in the country arise from abuse and mishandling during importation, transport, export and use. The significance of this is exemplified by the increasing cases of chemical accidents, poisoning, air, water and soil pollution.
3. Apparently there is adequate legal framework across the sectors which are under constant review. In addition, there are also non-regulatory voluntary instruments for chemicals risk reduction and general management. However, enforcement of the legislation is still weak.
4. There is insufficient information and data on chemical incidences and toxicity available to the public. Efforts towards generating and availing information to stakeholders are underway though there is limited cooperation between the stakeholders who have the information and those who need to use the information for decision making.
5. There are specialised enforcement/ regulatory and research institutions and agencies in the country that address chemical management at different levels of chemicals lifecycle. However, they lack coordination arrangement and synergy in execution of their mandates and activities.
6. The chemicals and hazardous waste industry, public interest groups and research institutions do conduct activities addressing chemical risks management at different levels of chemicals life cycle. However, most of the risk management projects and programmes are short term with limited follow-up activities. Furthermore, most of the activities are sectorally driven and implemented.
7. There are adhoc interministerial coordination mechanisms for chemicals and wastes that are specific and time bound. However, the country lacks a well organized inter-ministerial coordination mechanism for chemical management to enhance collaboration among ministries and respective agencies in implementing their respective mandates and competencies and facilitate information sharing. Consequently, resources mobilisation and optimization to foster a comprehensive approach to the management of chemicals is inefficient.
8. There are chemicals monitoring, pollution and health data in both public and private sectors that address various aspects of chemical risks management. Access to the information and its application in chemical management is poor due to their mode of storage and retrieval making the establishment of a chemicals data exchange portal an urgent need.
9. There are national institutions with specialised human risk assessment capacities and technical infrastructure. Basic technical training in various aspects of chemical risk and hazard management is available locally at universities and specialised training institutions. However, there is a major deficiency in specialised training on chemicals of global concern and related technical infrastructure which require support from the government, development partners, private sector and the civil society.

10. There have been several chemical accidents and incidences that have resulted in deaths and injuries as a result of low level of chemical emergency preparedness, response and follow up in the country. This calls for putting in place emergency preparedness and response structures and mechanisms at national and local levels.

11. There are national institutions charged with mandates of creating awareness among the workers and ensuring occupational safety at work places. However, awareness on chemical management among the public is still very low leading to misuse and mishandling of toxic chemicals with adverse effects on human health and environment

12. Kenya has ratified most multilateral environmental agreements on chemicals and wastes covered by OPS of SAICM such as the Stockholm Convention, Basel Convention, Rotterdam, and ILO among others. However, domestication of some of the conventions and agreements has not been completed due to financial and technical impediments.

13. There are institutional and administrative structures in the ministries and agencies to address chemicals risk management. However, there are deficiencies in terms of human and financial resources for chemicals management at all levels of chemical life cycle.

14.2 Recommendations

In view of the issues raised in Chapters 1 through 13, the following recommendations should be considered in order to manage chemicals in an environmentally sound manner

1. Formation a national information system for sound management of chemicals life cycle including production, import, transport, use and export.

2. Strengthen enforcement of the EMCA 1999 in extraction and use of national chemical and protection of the general public from hazardous national chemical deposits.

3. Develop SAICM policy to guide chemical management and related chemicals challenges in the country. This should include reviewing the existing chemical regulations to provide national framework for sound management of chemicals.
4. Review the existing national chemical data and build strategies and mechanisms to enhance comprehensive data generation and information exchange. This should include strengthening the CIEN among the government ministries and stakeholders in the chemicals sector.
5. Prioritize areas of research related to chemical effects to environment and seek funding from established international financing instruments and mechanisms in cooperation with the relevant ministries in corroboration and coordination with research institutions.
6. Strengthen collaboration among the research institutions, MEAS, universities, industries, public interest groups and the private sectors in addressing chemical management activities including chemicals under conventions such as that of Montreal, Stockholm among others.
7. Establish interministerial coordination mechanism to strengthen collaboration among the government ministries, agencies, the private sector and the civil societies addressing chemical management.
8. Strengthen chemical risk management and application of chemical information including storage and retrieval, and access to international databases.
9. Build human and technical capacity of national research institutions, universities and government agencies to comprehensively address the chemical life cycle including production, importation, transport, use, export and disposal on sound management of chemicals through international programmes.

10. Establish national chemical emergency preparedness, response and follow up structures and mechanisms to support management of chemical accidents including spills, fires, poisoning and explosions.
11. Strengthen safety and awareness among the workers and general public, including children.
12. Develop materials for awareness creation for school children on prevalent hazardous/dangerous chemicals in school and domestic arena
13. Promote coordination in addressing the multilateral environmental Develop training curricula for medical personnel to handle chemical poisoning up to the rural level (dispensary).
14. Mainstream chemicals management issues in the country's development agenda and develop adequate human and technical capacity to address chemical management.

Annex 1
Population of People in the Counties

	County	MALE	FEMALE	TOTAL
1	Nairobi	1,605,230	1,533,139	3,138,369
2	Kakamega	800,989	859,662	1,660,651
3	Bungoma	795,595	835,339	1,630,934
4	Kiambu	802,609	820,673	1,623,282
5	Nakuru	804,582	798,743	1,603,325
6	Meru	670,656	685,645	1,356,301
7	Kisii	550,464	601,818	1,152,282
8	Kilifi	535,526	574,209	1,109,735
9	Machakos	543,139	555,445	1,098,584
10	Migori	499,298	529,281	1,028,579
11	Mandera	559,943	465,813	1,025,756
12	Kitui	481,282	531,427	1,012,709
13	Kisumu	474,760	494,149	968,909
14	Homa Bay	462,454	501,340	963,794
15	Muranga	457,864	484,717	942,581
16	Mombasa	486,924	452,446	939,370
17	Uasin Gishu	448,994	445,185	894,179
18	Makueni	430,710	453,817	884,527
19	Turkana	445,069	410,330	855,399
20	Narok	429,026	421,894	850,920
21	Siaya	398,652	443,652	842,304
22	Trans-Nzoia	407,172	411,585	818,757
23	Kericho	381,980	376,359	758,339
24	Nandi	376,488	376,477	752,965
25	Bomet	359,727	364,459	724,186
26	Nyeri	339,725	353,833	693,558
27	Kajiado	345,146	342,166	687,312
28	Wajir	363,766	298,175	661,941
29	Kwale	315,997	333,934	649,931
30	Garissa	334,939	288,121	623,060
31	Nyamira	287,048	311,204	598,252
32	Nyandarua	292,155	304,113	596,268
33	Baringo	279,081	276,480	555,561
34	Vihiga	262,716	291,906	554,622
35	Kirinyaga	260,630	267,424	528,054
36	Embu	254,303	261,909	516,212
37	West Pokot	254,827	257,863	512,690
38	Busia	232,075	256,000	488,075
39	Laikipia	198,625	200,602	399,227
40	Elgeyo Marakwet	183,738	186,260	369,998
41	Tharaka	178,451	186,879	365,330
42	Marsabit	151,112	140,054	291,166
43	Taita Taveta	145,334	139,323	284,657
44	Tana River	119,853	120,222	240,075
45	Samburu	112,007	111,940	223,947
46	Isiolo	73,694	69,600	143,294
47	Lamu	53,045	48,494	101,539
	Total	**19,192,458**	**19,417,639**	**38,610,097**

Fig.2 Map of the counties

Annex: Names and Addresses of Key Individuals and Organisation

Members of the Inter-ministerial SAICM Committee

Government Sector	Agency	
Ministry of Environment and Mineral Resources	SAICM Focal Point Permanent Secretary's Office	Mr. Ali Daud Mohamed
	National Environment Management Authority	Mr Mwai Muitungu
Ministry of Industrialisation	Kenya Industrial Research Institute(KIRDI)	Dr Zuriel Muturi
Ministry of Health	Government Chemist(GC)	Mr William Munyoki
Ministry of Water and Irrigation	Water Resources Management Authority(WARMA)	Mr Noel Ndeti
Ministry of Agriculture	Pest Control Products Board(PCPB)	
Ministry of Labour	Department of Health and Safety Services(DOHSS)	Mr Peter Kahumbi
Ministry of Justice an Constitutional Affairs	Attorney General Chambers	
Ministry of Public Health Services	Office of the Chief Public Health Officer	Mr KephaOmbacho

Members of the Inter-ministerial SAICM Committee (Business and Industry)

Sector	Organisation	
Chemicals	Kenya Association of Manufacturers	MS Nellie Chario
Agriculture	Agricultural Association of Kenya	Mr Richard Sikuku
Services	Petroleum Institute of East Africa	

Members of the Inter-ministerial SAICM Committee (Public Interest and Labor Organizations)

Sector	Organisation	
Universities and Academia	Chemistry Department, University of Nairobi	Mr Vincent Madadi
Health	Physicians for Social Re sponsibility	Dr Paul Saoke
Civil Societies	iLima Kenya	Mr Griffin Ochieng

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