The International POPs Elimination Project (IPEP)

Fostering Active and Effective Civil Society Participation in Preparations for Implementation of the Stockholm Convention

Hotspot report for a Contaminated Site: Kitengela Obsolete Pesticides Store in Kenya

Environmental Liaison, Education and Action for Development (ENVILEAD)

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Kate Rachel Wambui
ENVILEAD
P.O Box 14845-00100
Nairobi KENYA
Tel: +254-20-212081, +254-722-817362
E-mail: envilead@care2.com, rachel_kamande@yahoo.com , janeffkate@jay.net

About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

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ACCRONYMS AND ABBREVIATIONS

AAK:	Agrochemicals Association of Kenya
AGENDA:	AGENDA for Environment and Responsible Development
BAT:	Best Available Techniques
BEP:	Best Environmental Practices
DDT:	DichloroDiphenylTrichloroethane
DTI:	Daily Tolerable Intake
DLCO:	Desert Locust Control Organization
EMCA:	Environment Management and Coordination Act
EU:	European Union
GIFAP:	The International Trade Association for Manufacturers of Agrochemical Products
IPEN:	International POPs Elimination Network
IPEP:	International POPs Elimination Project
KIWM:	Kenya Institute of Waste Management
NIP:	National Implementation Plan
OECD:	Organization for Economic Cooperation and Development
POPs:	Persistent Organic Pollutants
PPSB:	Plant Protection Services Branch
PCPB:	Pest Control Products Board
U-POPs:	Unintentional Persistent Organic Pollutants
WHO:	World Health Organization

1. EXECUTIVE SUMMARY

The Kitengela Pesticides Store study was carried out by ENVILEAD, as part of the IPEP Hotspots initiative. The store is located in the Kitengela area of Kajiado district in Kenya's Rift Valley province.

The Kitengela pesticides store is used by the Ministry of Agriculture as a temporary storage facility for obsolete pesticides and other chemicals prior to their disposal. The store had for a long time been suspected to be a POPs hotspot, but no formal investigation had been done.

The study involved site visits by the investigating team, interviewing various stakeholders, taking photographic records, making visual observations, doing library searches and taking samples for basic laboratory analysis.

The study found out that the Kitengela site is contaminated with a wide variety of toxins, including POPs pesticides and POPs industrial chemicals that are covered under the Stockholm Convention (www.pops.int). The estimated weight of contaminated soil around the store is 400 tonnes, and the site is a potential health hazard to the local community.

In addition to the store, the study identified an incinerator located within a residential area, about two kilometers from the store, which is a likely source of U-POPs. The incinerator is used to burn materials from the store.

The key recommendations of the study are that:

- Additional and more comprehensive studies of the site and related sites should be carried out for the purpose of gaining accurate information for the execution of the country's NIP for the Stockholm Convention
- An effective non-combustion-based POPs disposal method should be identified and put to use
- Incineration of toxic chemicals should be stopped
- A new store for obsolete pesticides and other chemicals should be built, and it should meet required standards.
- Develop suitable and more effective regulatory framework for POPs management in the county
- Adopt BAT and BEP from countries with working NIPs, and where necessary modify the same to suit Kenya's conditions
- Develop large scale organic farming programmes
- Develop support networks of stakeholders involving private sector, civil society and governmental organizations capable of adding value to the POPs elimination movement.

2. INTRODUCTION

Over the past forty years, Kenya has had one of the highest population growth rates in the world, currently at 2.56% according to the World Fact Book. This rapid population growth has led to much pressure for higher food production as well as other economic activities that have resulted in increased chemical use. This has translated to increased susceptibility to chemical pollution in the country[1]. With three quarters of Kenyans being reliant on agriculture, pesticides constitute the largest proportion of chemical pollutants in the country.

In Kenya, the use of Chemicals listed in Annex A and B of the Stockholm Convention was extensive in the 1970s and 80s. Various studies carried out all over the country have confirmed the presence of these chemicals in the environment. The Kenya National Inventory of Persistent Organic Pollutants (2004) draft report shows that some stockpiles of obsolete pesticides and other persistent chemicals (POPs) are present in various parts of the country. Wandiga et al (2002) reports the presence of organochlorine pesticides in marine samples along the Indian Ocean coast. Also, POPs residues were found in egg samples, ground water and breast milk (Kanja et al 1986, Wandiga et al 2002, Kahunyo et al 1988, Mwanthi et al 1998). A recent IPEN study carried out by ENVILEAD and ARNIKA Association revealed that the dioxins content in eggs sampled from chickens around Dandora dumpsite is more than six times the EU's DTI limit, while that of PCBs is four fold higher (ENVILEAD, ARNIKA Association et al, 2005). DDT and its metabolites have been found in drinking ground water sources many years after use in different parts of the country (Mwanthi 1998). This testifies the persistent nature of these chemicals, and the fact that they can be found long distances from the point of generation.

2.1 POPs Pesticides and Chemicals in Kenya

Kenya ratified the Stockholm Convention and became a party on 24th September and 23rd December 2004 respectively. Official records from the Pest Control Products Board (PCPB) of Kenya indicate that no POPs-Pesticides as per the Stockholm Convention were imported in the country between 2001 and 2004. However, this is not evidence that no POPs pesticides were imported in the country for there are chances of illegal imports.

Even though the use of most of the POPs chemicals in Kenya has been banned or restricted[2], solutions for stocks predating the banning/restriction are yet to be found. PCPB records for imported pesticides between the years 2001 and 2004 indicate that 40,000kg and 13,800 litres of Lindane and Dicofol were brought into the country from different parts of the world. Although these POPs are not amongst those banned by the Stockholm Convention, they nevertheless present a challenge in methods of disposal.

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[1] Clark and Palmer (1983), estimate that 2 million Hectares of land are lost each year due to toxification. For instance, in the year 1992, 6 out of the 24 OECD member countries had more than 80,000 contaminated sites between them (Hilz 1992).

[2] See Annex 2 for a list of the banned/restricted pesticides in Kenya.

The presence of these POPs chemicals, most of which may not have been recorded and are already dispersed in the ecosystem, constitutes the first challenge in society's response to the problem of POPs. This is the challenge of POPs hotspots, which are contaminated sites requiring effective means of clean up and rehabilitation. Studies show that 30% of suspected POPs hotspots in Kenya have not been inventoried, implying that there is yet much that needs to be done before Kenya can have the necessary information for a comprehensive plan of action regarding POPs hotspots.

The second challenge involves those POPs stocks that have not yet been used but require safe disposal. In the PCPB list of banned pesticides[2], there are several products that were banned in the year 2004. This implies that a significant quantity of the products is still in existence and requires disposal. The Kitengela study sought to establish the existence of such stockpiles at the store.

The third challenge comprises putting in place measures that can ensure no further importation or generation of POPs substances. This involves capacity building initiatives such as assisting customs officials at border points to be able to identify these banned substances and awareness creation among farmers and other stakeholders at the community level.

Understanding the POPs situation in Kenya is a vital step towards developing and implementing effective solutions for hotspots. The best approach to POPs management is to use information such as that gathered from the hotspots studies for the purpose of awareness creation, training programmes and policy development.

This study has added to the body of information on POPs in Kenya, and shall assist in prioritizing action for the elimination of POPs, and mitigation of their effects in the country. In addition, it will contribute to the understanding of the problem and development of programmes that will enhance effective POPs reduction and elimination for the Stockholm Convention National Implementation Plan.

2.2 Objectives of the Study

Whereas the study's general objective was to provide necessary information on a contaminated site in Kenya as part of the International POPs Elimination Project (IPEP), the central objective was to establish whether the Kitengela site is indeed contaminated with POPs pesticides and other toxic wastes.

The specific objectives, which the study was designed to achieve, included inter alia:

i. To identify the types and quantities of obsolete POPs, and toxic wastes found at the site[1]
ii. To find out the sources /origins of the obsolete POPs and toxic wastes found at the site
iii. To find out the site history, and its environmental characteristics.
iv. To investigate the effects of the site on the local community.
v. To find out the level of community awareness on the dangers of the chemicals at the site
vi. To explore the possibilities of site cleanup.

3. METHODOLOGY

To achieve the objectives of this study, both primary and secondary data was used. Primary data comprised local views, perceptions and opinions related to the contaminated site and the general use of POPs pesticides among the local community. Various government and other resource persons provided valuable primary data for the study.

The state of the storage facility, its capacity to protect workers, as well as the methods of disposal was studied through observation by the researchers. Additional data was gathered through collection of samples and taking photographs of the store and interviewing the workers and members of the local community.

Secondary data was obtained from both published and unpublished information on POPs pesticides and POPs industrial chemicals. Previous studies carried out on POPs chemicals at the global, regional, national and local levels were reviewed.

3.1 Nature of Data

The study was a preliminary investigation, intended to open the way for further detailed investigations of the same site and other similar sites in the country.

3.2 The Scope of the Study

The study was a preliminary investigation, intended to open the way for further detailed investigations of the same site and other similar sites in the country.

3.3 Preparation for the Study

Staff recruitment and training: Four research assistants were recruited and trained for fieldwork.

Stakeholders' identification: Various stakeholders were identified and approached for their views on the issue under investigation. These stakeholders included:

i. Members of the local community
ii. Health care professionals
iii. National Environmental Management Authority (NEMA)
iv. Pest Control Products Board (PCPB)
v. Plant Protection Services Branch
vi. Government Chemists
vii. Soil Survey of Kenya
viii. Agrochemicals Association of Kenya
ix. Kenya Institute of Waste Management

Protocol Establishment: Before the study commenced, key stakeholders were approached and the objectives of the study explained to them.

Reconnaissance Study: In order for the Research team to familiarize itself with the study area, a pre-visit was done before the actual study.

Data Analysis: Descriptive analysis was used to summarize the collected data. Analytic statistics were not employed.

4. STUDY AREA

4.1 Type of Site

The study was conducted within the area around the pesticide store and Kitengela town, an area covering approximately 3km².

4.2 Location of Site

The site lies at an altitude of 1640 meters above sea level, longitude 36º East and latitude 1º South.

Administratively, the site is found in Kitengela Sublocation, Ildamat Location, Central Division of Kajiado District in the Rift Valley Province of Kenya.

The site is approximately 27 kilometers South of Nairobi, the capital city of Kenya.

4.3 Climate

The area has a bimodal rainfall pattern with short rains falling between October and December while the long rains falling between March and May.

The coolest period is between the month of July and August while the hottest are from November to April. The annual rainfall average is about 1,100 mms. The temperature of the area is influenced by altitude and season; the highest temperature of about 34ºC is recorded during the dry season.

4.4 Water Resources

The area adjacent to the site does not have adequate surface water for livestock, human consumption or irrigation. To a greater part, the area depends on underground water reserves. Alternative sources of water for domestic and livestock are subsurface resources such as water pals, dams and shallow wells. The water table is low in the area. The rocks are generally porous and allow water to percolate to great depths into the ground. Boreholes are drilled for a depth of about 90 meters.

4.5 Soils and Topography

The area is covered by basement rock soils arising from different cycles of erosion; they are reddish brown sand soils. Generally, this soil is of low fertility.

Topographically, the area is located in the Athi-Kapiti plains, an area of open rolling land with some few dry riverbeds.

4.6 The Local Community

The area adjacent to the site was inhabited by semi-nomadic pastoralist Maasai. The land was owned communally. However, this lifestyle has undergone changes due to ongoing land adjudication and subdivision leading to individual land tenure system.

The area's proximity to Nairobi and Athi River towns has also attracted high immigration thus exposing the area to high population growth estimated to be 4.51% annual growth rate, which is significantly above the national growth rate of 2.56% (World Factbook - 2005).

4.7 Wildlife and Plant Life

The site and the surrounding area forms part of the Kitengela Game conservation area, which used to act as a wildlife migratory corridor between Nairobi National Park and Maasai Mara Game Reserve. However, this corridor has now been blocked as a result of human settlement and industrialization.

5. HISTORY OF THE SITE

The Kitengela store was built in the year 1967 when the Ministry of Agriculture acquired the land from the Ministry of Health. The land is however in dispute as the Maasai community claims they were displaced from the land.

The site was selected because the land on which it is located had little economic value, was relatively far from human settlements and was secure. The store is one among three similar stores in Kenya; the other two are in Mandera and Wajir, but have been closed down. The land surrounding the site is used for sheep and goat breeding purposes, a project whose aim is to improve the quality of the sheep and goats owned by the local Maasai community.

Initially, the facility was used by DLCO for the storage of pesticides for the control of locusts and mosquitoes. But with time it began storing obsolete pesticides and other toxic waste collected from coffee co-operative societies, flower farms and Kenya Farmers Association (KFA) stores from all over the country.

Owing to the fact that the store had been established only as a temporary facility, by the year 2000 it was handling many more chemicals than it was designed for, which were leaking into the ground and posing a danger to the environment. A decision was therefore made to destroy the unmanageable stockpiles and renovate the store[3].

The Plant Protection Services Branch (PPSB) of the Ministry of Agriculture is responsible for the site, and has two in-house trained personnel to man the site. At present obsolete POPs and other toxic wastes are temporarily stored at the site before being destroyed.

[3] Pictures of the store's current state can be seen on annex 4

6. STUDY FINDINGS

The store, which was constructed in 1967, covers an area of 21,000 ft² and is made of a mixture of wooden off-cut and iron-sheet walls, with iron-sheet roofing. It was constructed as a temporary storage facility for chemicals from DLCO, but was over time gradually converted to a general store for obsolete pesticides and other chemicals, managed by PPSB. This conversion in usage was however done without upgrading the physical facilities of the store.

It was confirmed by the Agrochemicals Association of Kenya (AAK) that the chemicals deposited at the store were Aldrin , Dieldrin, Heptachlor , Endrin and Furandan (Furandan is a seed treatment whose active ingredient, Carbofuran, is mercury-based). Others included Carbamates for Malaria vector control and Organophosphates such as Endosulfan, Fungicides and Paints.

A comprehensive laboratory analysis of samples from the site was not possible at this phase of the study. Some soil samples were however collected from the store and taken to the Government Chemists for analysis, which confirmed the presence of organophosphates and carbamates. It should be noted that the samples were collected from the surface of the floor and do not represent what may have leaked into the soil prior to the year 2000, when the dirt floor was cemented and the chemicals disposed.

In the year 2000, AAK undertook to cleanup the Kitengela store and hired the services of Dr. Phillip Mwabe, an engineering lecturer at the University of Nairobi, as the consultant for the clean up. Dr. Mwabe, through his organization (KIWM) advised chemical dilution as the best method for the clean up. According to a resource person from KIWM, the chemicals were diluted (the original quantities were 188 tonnes of stockpiles which were diluted[4] with 6,000 tonnes of dilutants). The resulting mixture was sold to pineapple farms and pesticide manufacturing firms to be reused as pesticide, while the drums that contained the chemicals were smelted by Environmental and Combustion Consultants Limited (ECC) and made into welding bars. It is worth noting that chemicals with POPs characteristics have enormous concentration factors and therefore dilution as a method of clean up is inappropriate. The store is currently almost empty, as most of the chemicals were disposed off in the year 2000.

6.1 The Condition of the Store

The store was found to be in a very poor physical state, with the potential of being a serious health and environmental hazard. The store does not meet the basic requirements[5] for a chemical store as outlined by the International Trade Association for Manufacturers of Agrochemicals (GIFAP). The following are the key findings about the store:

[4] An issue which is controversial since sources from the government claim that the chemicals were not diluted but instead incinerated by KIWM, an organization founded by Dr. Phillip Mwabe, the consultant hired by AAK to handle the clean up of the obsolete chemicals at the store in the year 2000. See Annex 2 for the Standard Newspaper article with the story.

[5] A picture of the store in its current form can be seen on Annex 4.

1. The stockpiles remaining at the store comprise about 40 drums of contaminated soil and a few other chemicals for desert locust control, such as Quelotox and Fenthion, from DLCO-Wilson airport.
2. Between the time of its construction (1967) and the year 2000, the store had a dirt floor. The floor was cemented in the year 2000 but has since corroded and does not offer much protection from toxic chemicals' leachate.

3. The chemicals at the store were collected from KFA stores, Agricultural Cooperative Societies around the country, coffee and flower farms, and the Desert Locust Control Organization of East Africa (DLCO).
   During the first visit at the store there was a pungent odour emanating from the chemicals, which caused headaches among several members of the research team, after only a few minutes at the store. An unusual whitish rusting of the iron sheets was also observed.

The insecticides used to control desert locusts included Dieldrin and other organochlorine insecticides, which were eventually banned because of persistence, environmental effects, and bioconcentration in fatty tissues. Replacement insecticides included the organophosphate products fenitrothion, malathion and diazinon, and the carbamates carbaryl and propoxur. These were less hazardous to the environment but more acutely hazardous to human and animal health.

6.2 Store Management

Two officers from PPSB carry out the daily management of the store. The officers have received in-house training, facilitated by AAK, for their work. The following was observed about the store's management:

1. Toxic chemicals in the store are exposed to further deterioration due to adverse climatic conditions. The chemicals are not protected from the area's scorching temperature (which goes as high as 34ºC).
2. It was observed that the chemicals in the store were not arranged in an orderly manner. They had just been 'dumped' on the floor, thereby increasing chances of cross-contamination and environmental contamination.
3. There was no documentation on the time, day, sources, types and quantities of toxic chemical inflows and outflows at the store. Proper documentation would help in the management and monitoring of the toxic waste, hence reducing chances of environmental contamination
4. Containers of the obsolete chemicals had no clear distinct labels, this is against the Pharmacy and Poison Act, chapter 244, which requires that poison containers should be distinctly and clearly labeled.
5. The store does not display clear warning signs. No notices were placed on the outside of the store warning the general public of the eminent dangers of the stored chemicals as poison and inflammable.

6.3 Risk of Contamination

The following was established about the store's potential to contaminate its site:

1. Spillage on the floor, which until the year 2000 was not cemented[6], may have led to seepage of the chemicals into the soils and eventually into the ground water sources.
2. The Kitengela seasonal river passes about 50 meters from the store, and is used by livestock belonging to the local (Maasai) community as well as a goat-breeding project belonging to the Ministry of Agriculture.
3. It was established from the consultants (KIWM) that contamination of the soils under the store is at least 7 feet deep (this is the depth they were able to excavate) and over 1kilometer wide. It is estimated that the contaminated soil around the store is approximately 400 tonnes[7].

6.4 Other Relevant Findings

Resource persons from the Ministry of Agriculture expressed concern that the store, which is the only operational obsolete chemicals' storage facility in the country, does not have the capacity to handle the storage and disposal of such chemicals (an estimated 300 tonnes of chemicals have passed through the store to date). The following was also established about the storage and disposal of obsolete chemicals in the country:

1. There are similar other stores in Wajir and Mandera Districts in North Eastern Province of Kenya, but are currently not operational.
2. Currently, DLCO, based at Wilson airport, is holding 2 tonnes of laboratory waste, which they want Ministry of Agriculture to dispose through the Kitengela store.
3. There are claims that KIWM did not carry out the waste disposal activity in a proper manner especially since some chemicals were found dumped in bushes less than a kilometer from the store. Within a short time after the dumping, 14 cows were reported dead[8] – an issue that landed KIWM in court in October 2001.
4. The obsolete chemicals and contaminated soil in the store after the year 2000 have been and continue to be disposed by KIWM through incineration. This is despite incineration being a potential source of U-POPs, and being discouraged by the Stockholm Convention (Annex C, Stockholm Convention). KIWM does this by mixing the chemicals with soil and then incinerating the mixture.
5. The condition of the KIWM incinerator, such as its operating temperatures and administrative procedures, are unknown because the KIWM management was very reluctant to allow a visit to the incineration site. It is likely that the incinerator burns at temperatures too low to be effective in preventing the formation of U-POPs.
6. It was also established from resource persons in the Ministry of Agriculture that at present, Kenya has neither hazardous substances nor incineration standards of her own.

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[6] See Annex 4 for picture of the floor of the store before the year 2000. After cementing, the floor has since corroded. Picture 9 on Annex 4 shows how it is today.

[7] Currently, the store is so wide open, (more than provision for adequate ventilation) that there is the potential for wind to blow from either side taking chemicals (dust) and smell to the nearby community/Kitengela River.

[8] KIWM disposed some of the chemicals through incineration at their incinerator, which is situated at the heart of Kitengela shopping center, while the others were dumped in bushes not far from the store. It is suspected the 14 cows died from consuming the dumped chemicals.

6.5 Effects of the Site on the Local Community

Members of the local community identified the following as adverse effects from the store:

i. Emission of pungent irritating smell.
ii. Skin and respiratory system irritation
iii. Death of livestock belonging to one farmer who had sprayed his livestock with the chemicals from the store

The local community was poorly informed on the off-site and chronic effects of POPs chemicals. Discussions with locals established that they were not aware that the chemicals at the store could contaminate the water, air, soil and food they use. The community was also unaware of the carcinogenic properties, and other adverse effects of POPs chemicals to human life. These have been documented in numerous studies such as those carried out by the United Nations (See text box below)[9].

POSSIBLE HEALTH EFFECTS OF PESTICIDE EXPOSURE:

In addition to acute pesticide poisoning that can result in death, a growing body of epidemiological research and studies of laboratory animals suggest the possible link of long-term exposure to certain pesticides and:

- *Abnormal growth and development, and failure to acquire normal organ function;*
- *Endocrine/hormone disruption: certain pesticides in very small doses may mimic or block hormones or trigger inappropriate hormone activity, which can cause for example, sterility, lowered sperm counts and breast cancer;*
- *Impaired development of the nervous system that can result in lowered intelligence and behavioural abnormalities;*
- *Cancers, including leukemia, sarcoma, lymphoma, Wilm's (malignant tumour of the kidney) and brain cancer;*
- *Compromised immune system, which in children further exacerbates the risk of infectious disease and cancer, thus increasing mortality rates. This is of special concern in developing countries where people can be simultaneously to both pesticides and infectious pathogens when their immune systems are already compromised by other factors, such as malnutrition or HIV/AIDS.*
- *POPs are known to cause feminization of males. Colborn et al (1996) established that young roosters treated with DDT had severely underdeveloped testes and failed to grow the normal combs and wattles roosters use for social display.*

6.6 Policy and Legislation

Kenya has several pieces of legislation addressing issues related to POPs chemicals. However, consultations with resource persons show that the major problem in Kenya is not formulation of laws, but enforcement of the current laws. The various regulatory bodies such as the Pest Control Product Board (PCPB), lack the capacity to enforce and implement their mandate. It was also reported that lack of proper co-ordination of

[9] Children in the New Millennium: Environmental Impact on Health; UNEP, UNICEF & WHO - 2002. www.unep.org, www.unicef.org, www.who.int

the various organs of the Government dealing with POPs chemicals frustrates or hinders their effectiveness. The following is the legislative framework of handling POPs in the country:

i. The Pest Control Products Act of 1982 constituted the Pest Control Product Board (PCPB) in 1983. The Board regulates the importation, exportation, manufacture, distribution and use of products used for control of pests.
ii. The Food, Drugs and Chemical Substances Act, Chapter 254 makes it an offence for any person to sell any food that has poisonous or harmful substances.
iii. The Pharmacy and Poisons Act, Chapter 244, controls the profession of pharmacy and trade in drugs and poisons. A container of poison must be distinctly and clearly labeled and poisons must be stored in safe custody.
iv. The Public Health Act, Chapter 242, protects human health from health endangering substances.

The Environment Management and Coordination Act, 1999, provides a framework for the management of POPs chemicals in Kenya.

6.7 NGO – Government Collaboration

The study team found out that despite initial indicators to the contrary, government officials were very willing to give information and assist in any other ways necessary. This was especially the case with the office of the National POPs Coordinator within NEMA. Generally, there appears to be much greater receptiveness to collaboration with NGOs on the part of government than is commonly believed.

7. KEY CHALLENGES

The implementation of the Stockholm Convention in Kenya faces three main challenges. These are:

7.1 Lack of Sufficient Information

Rational planning for any significant social effort requires the availability of relevant accurate information. According to the National POPs inventory, 30% of suspected POPs Hotspots in the country have not yet been visited for the purpose of assessing their status. It is worth noting that even for those that have been visited it is mostly preliminary surveys that have been undertaken, and not adequately detailed analysis for planning purposes. By carrying out the Kitengela study, it is expected that the knowledge gap for planning purposes could be narrowed.

7.2 Lack of Sufficient Resources

One of the distinguishing features of pollution clean up exercises is the high cost of such exercises. Safe clean ups require high degrees of technical competence and plenty of financial resources, which Kenya is ill prepared for. For instance, in 1992,

treatment of hazardous waste such as PCBs cost up to $3,000 per ton (Hilz 1992). In the USA, the Superfund program, designed to clean up old waste dumps, had already reached a budget of $10 billion USD (Third World Network 1998). By approaching the POPs problem as a challenge extending beyond national borders, it becomes possible to share resources in such a way as to overcome the deficiencies of particular countries. This however cannot be done without knowing precisely what needs to be done and where. It is for this reason that studies such as that of the Kitengela Hotspot are necessary and critical to the success of the Stockholm Convention.

7.3 Lack of Sufficient Public Awareness

The surest guarantee of success for the Stockholm Convention lies with the general public owning the problem of POPs. It is through such ownership that individual behaviour can be modified and pressure for change exerted on institutions, so as to make the necessary changes on the POPs situation.

Creating the kind of public awareness required for change is however only possible with a clear understanding of how conditions in the environment affect one in the real world. For instance, in Nigeria, dumping of PCBs-contaminated waste made the government request approximately 30,000 farmers to stop harvesting their farmland in order to prevent the intake of unsafe amounts of chemicals (Ogumseitan 1988 in Hilz 1992).

Another illustration is the concern by the European Union market over possible fish contamination by chemicals from Lake Victoria, which led to a ban on importation of fish between 1998 and 2000. The result of this act was a drastic reduction on foreign exchange earnings, which severely affected the economies of the three East African States (Kenya National Inventory of Persistent Organic Pollutants 2004). Studying and taking action on hotspots would reduce the likelihood of instances such as these.

8. CONCLUSION

The study of the Kitengela obsolete pesticides store points to the need for a tri-pronged approach to addressing the problem of POPs hotspots in Kenya. This includes:

- ✓ ***Addressing the problems of the past***: The persistent nature of the chemicals in question implies that mistakes of the past cannot be dismissed, even as plans for the future are made. It is therefore necessary to put in place strategies to identify all existing POPs hotspots, build safe storage facilities for obsolete chemicals, and establish environmentally sound disposal methods for such chemicals.

- ✓ ***Acting on present concerns*:** Although the ban on POP chemicals appears to be largely effective in the country, it is necessary to build the capacity of monitoring agencies, including relevant community-based organizations, NGOs and other civil society organizations, to ensure banned chemicals do not find their way into the bio-sphere. Special attention ought to be paid to the problem of U-POPs, which is the biggest challenge of the present day. In addition, there is a

potentially big problem from the issue of DDT as a means of malaria control. There is pressing need to come up with strategies aimed at ensuring U-POPs and DDT do not create avenues for the formation of new POPs hotspots.

- ✓ ***Future needs*:** The best future defence against the creation of POPs hotspots is awareness, on the part of the general public, of the issues of chemical safety in the context of environmental health. Such awareness, which can be created through formal and non-formal learning environment, would be the surest foundation of galvanizing legislation, institutional framework and other public action to ensure additional POPs hotspots are not created in future.

9. RECOMMENDATIONS

The study recommends the following as the best environmental practices with regard to the Kitengela Hotspot and similar other hotspots:

1. There should be capacity building for all stakeholders in the POPs management programme, to be done in line with strategies laid out in the NIP for Kenya.
2. The NIP budget should include allocations for the management of obsolete stockpiles; especially clean up activities of the stockpiles.
3. A permanent store should be constructed with proper standards for the management of obsolete pesticides and other chemicals. These standards and guidelines have been developed and shall be incorporated within the Environmental Management and Coordination Act (1999)[10] and they should be adhered to during such constructions. In order to reduce or eliminate chances of such pesticides and chemicals contaminating the environment, GIFAP (The International Trade Association for Manufacturers of Agrochemical Products), recommends that pesticide stores should be located on high ground, which is not subject to flooding, and they must be rainproof. Floors should be impermeable to liquids and free from cracks, and should be designed to contain leakage. Stores should also be well ventilated to prevent excessively high temperatures and humidity, which can cause deterioration of these substances.
4. As far as possible, the clean up of any toxic waste stockpiles should be done at site.
5. Alternatives for non-combustion based disposal methods for persistent organic pollutants such as gas-phase chemical reduction, based catalyzed decomposition, super-critical water oxidation and others should be explored and suitable recommendations made.
6. Organizations with the necessary capacity should be encouraged and empowered to develop new ideas for dealing with toxic waste. Such empowerment should include the enhancement of research and development both in appropriate technology and social research.

[10] The process of incorporating these standards within EMCA is almost over.

7. Bulk purchases of pesticides that are not linked to actual need in the market should be discouraged. Also, donations of toxic chemicals (as aid from rich countries) should be carefully scrutinized in order to minimize the risk of becoming the disposal ground for obsolete chemical products.

AGENDA (2004) reveals that Tanzania received a donation of 600 metric tones of partially expired pesticides indicating that it was likely not a genuine donation but just dumping of the pesticides.

8. An operations manual for the proposed new store should be developed, to ensure the professional management of the facility. Such a manual should detail qualifications for staff at the store, storage procedures to be followed, inventory management of stockpiles inflows and outflows, safety measures and other such requirements. The operations manual should be developed into a guideline document for all pesticide and chemical stores in the country.
9. Among the key measures that should be included in the proposed operations manual are the following safety precautions:
    - Notices must be placed on the outside of pesticide stores warning the general public of the danger of the store.
    - Water must be immediately available and fire extinguishers must be available in chemical stores for use in case of accidental fires.
    - Personnel working in pesticide stores must always wear protective clothing such as gloves, gas masks and boots while working at the store.
10. All chemicals should be clearly and accurately labeled as a matter of law. This includes the used and obsolete chemicals in storage facilities, homes, factories etc.
11. NEMA should establish guidelines for all waste handling institutions, including a disclosure requirement for activities within such facilities, as well as verification methods of information provided in such facilities.
12. A strategic plan for public awareness in issues to do with POPs hotspots should be developed, and implementation of the same initiated.
13. A survey of the other two POPs pesticide hotspot sites in Mandera and Wajir (currently in operational) should be undertaken.
14. Proper standards and regulations should be established regarding management and use of all toxic chemicals.
15. Further detailed study needs to be carried out on the following key issues;
    - Determine the level of POPs chemicals contamination in the local biotic and abiotic systems
    - The health conditions of the workers at the KIWM incinerator as well as persons living near the incinerator should be investigated
    - The dioxins and furans levels in the biotic environment next to the incinerator needs to be determined
16. The medical professionals need to be trained /refresher courses in recognition and management of POPs chemical poisoning.
17. There is need to develop a handbook on practical and affordable practices for protecting communities at risk and the environment in general from the adverse effects of POPs.
18. Develop large scale organic farming programmes

ANNEX I - REFERENCES

1. AGENDA (2004), Vikuge Preliminary Site Report, Coastal Region, Tanzania.
2. Connett Paul, (1998), Municipal Waste Incineration: A Poor Solution for the 21st Century, Fourth Annual International Management Conference, Waste-to-energy, Nov 24-25, 1998, Amsterdam.
3. Colborn Theo, Dianne Dumanoski, and John Peterson Myers. 1996. Our Stolen Future. Dutton, New York.
4. Daily Nation, Friday, January 7, 2005.
5. Dawson W.G and Mercer W.B (1986), Hazardous Waste Management, New York, John Wilog & sons.
6. ENVILEAD, Arnika, IPEN Dioxin, PCBs and Waste WG 2005. Contamination of chicken eggs near the Dandora dumpsite in Kenya by dioxins, PCBs, and hexaclorobenzene. 24 March 2005. Available at: http://www.oztoxics.org/ipepweb/egg/HotspotReports/Kenya_eggsreport.pdf
7. Hilz C. (1992), the International Toxic Waste Trade. Van Nostrand Reinhold, New York.
8. Kammar K. (1994), Transboundary Movement of Hazardous Waste at the Interface of environment and Trade, UNEP.
9. Kahunyo J.M. Frosly A. Maitai C.K. (1998), A Survey of Organochloride Pesticide Residues in Chicken eggs, Journal of Toxicology and Environmental Health, 1998, 24(4): 543-50.
10. Kanja L. Skare J.U. Nafstad I. Maitai C.K. Lokken P. (1986), Organochlorine Pesticides in Human milk from Different areas of Kenya; 1983-1985. Toxicology and Environmental Health, 1986: 19(4) 449-64.
11. Kenya National Inventory of Persistent Organic Pollutants (POPs) under the Stockholm Convention unpublished draft report.
12. Kenyan Statutes, Public Health Act, Cap 242.
13. Mwanthi, M.A (1998), Occurrence of Three Pesticides in community water supplies in Kenya. Bulletin of Environmental contamination and Toxicology, Vol. 60, No. 4; 601-608.
14. Postel (1988), Controlling Toxic Chemicals. State of the World 1988, world watch Institute, New York: Norton and Company.
15. Reigart Routt J. and James R. Roberts, (1999), Recognition and Management of Pesticide Poisoning, 5th edition, US Environmental Protection Agency, Washington D.C.
16. The Food, Drugs and Chemical Substances Act, chapter 254.
17. The Pharmacy and Poisons Act, chapter 244.
18. The Environment Management and Co-ordination Act, 1999.
19. Toxics Link Report (2000), Trojan Horses: Persistent Organic Pollutants in India.
20. United Nations Environment Programme (1983), The State of the Environment, 1983, Nairob: UNEP.
21. United Nations Environment Programme (1986), The State of the Environment: Environment and Health, Nairobi: UNEP.
22. Wandiga S.O., Yugi P.O., Barasa M.W., Jumba I.O., Lalah J.O., (2002), The Distribution of Organochloride Pesticides in Marine Samples Along the Indian Ocean Coast of Kenya. Environment Technology, Nov 23 (11): 1235-46.

23. Weir D. and M. Schapiro (1981), Circle of Poison, Institute for Food and Development policy, San Francisco.
24. Wektelius S. and Edwards C.A. (1997), Organochlorine Insecticide Residue in African Fauna: 1971-1995. Rev. Environment Contamination Toxicology 1997; 151:1-37.
25. World Bank (1989), The Safe Disposal of Hazardous Waste: The Special needs and Problems of Developing Countries. World Bank Technical Working Paper No. 93 Vol. 1, Washington D.C: World Bank.
26. Wolff, A. (1972) the Art of Progress: Development and the Environment, Man's Home; The UN Conference on the Human Environment, UN - New York.

ANNEX 2 - NEWSPAPER ARTICLE

Toxic waste stored in Kitengela, Govt says

By **Ben Agina**

THE Government has issued an alert over the existence of 115 drums of toxic waste stored at a godown in Kitengela shopping centre.

Investigations carried by, Mr Isaac Musa Kilonzo, a senior chemist water quality /pollution division, in the Ministry of Environment and Natural Resources, revealed that 14 head of cattle have died from the waste.

The godown is owned by Dr Philip Mwabe, a lecturer at the Department of Engineering, University of Nairobi.

Kilonzo who was instructed to carry out thorough investigations by the PS in the Ministry, Dr Mohammed Isahakia, said Mwabe has been unco-operative whenever he is asked to open the godown for scrutiny.

He said in his report that during their investigations they came across a large consignment of unlabled chemicals.

The matter was handed over to the District Criminal Investigation Officer (DCIO) Kajiado, one Chief Inspector Mathenge.

The DCIO, according to Kilonzo, moved to the Kajiado law courts and obtained a court order to have the place opened.

Mwabe later claimed he had brought the waste to have it destroyed.

Kilonzo said the task force led by Mathenge took samples from the assorted drums of the chemical waste and delivered to the Government Chemist for analysis.

However, a Government analyst, Mr Habil Aketch Omondi, said some items were found to contain paraffin and several unidentified high hydrocarbon compounds.

Others, he said, may be classified as industrial chemical waste that are toxic and may be harmful to plants and animals.

Mwabe, however, accuses Kilonzo of having a personal vendetta. Speaking at his Baricho Road offices, Mwabe says he is registered scrap metal dealer under a company called Nyamaharaga Scrap Metals based in Isebania.

He refuted claims that he was storing toxic waste saying it is actually aluminium waste which he smelts to make steel components since 1999.

"If they think I am guilty of an offence why don't they take me to court, or am I above the law?" he posed.

Article printed by The Standard Newspaper in October, 2001 incriminating Mr. Mwabe, the founder of KIWM.

LIST OF BANNED/RESTRICTED PESTICIDES IN KENYA

PEST CONTROL PRODUCTS BOARD (PCPB)
P.O. BOX 13794 - 00800,
Westlands, NAIROBI.

BANNED/RESTRICTED PESTICIDES IN KENYA

REVISED MARCH, 2004

BANNED PESTICIDES

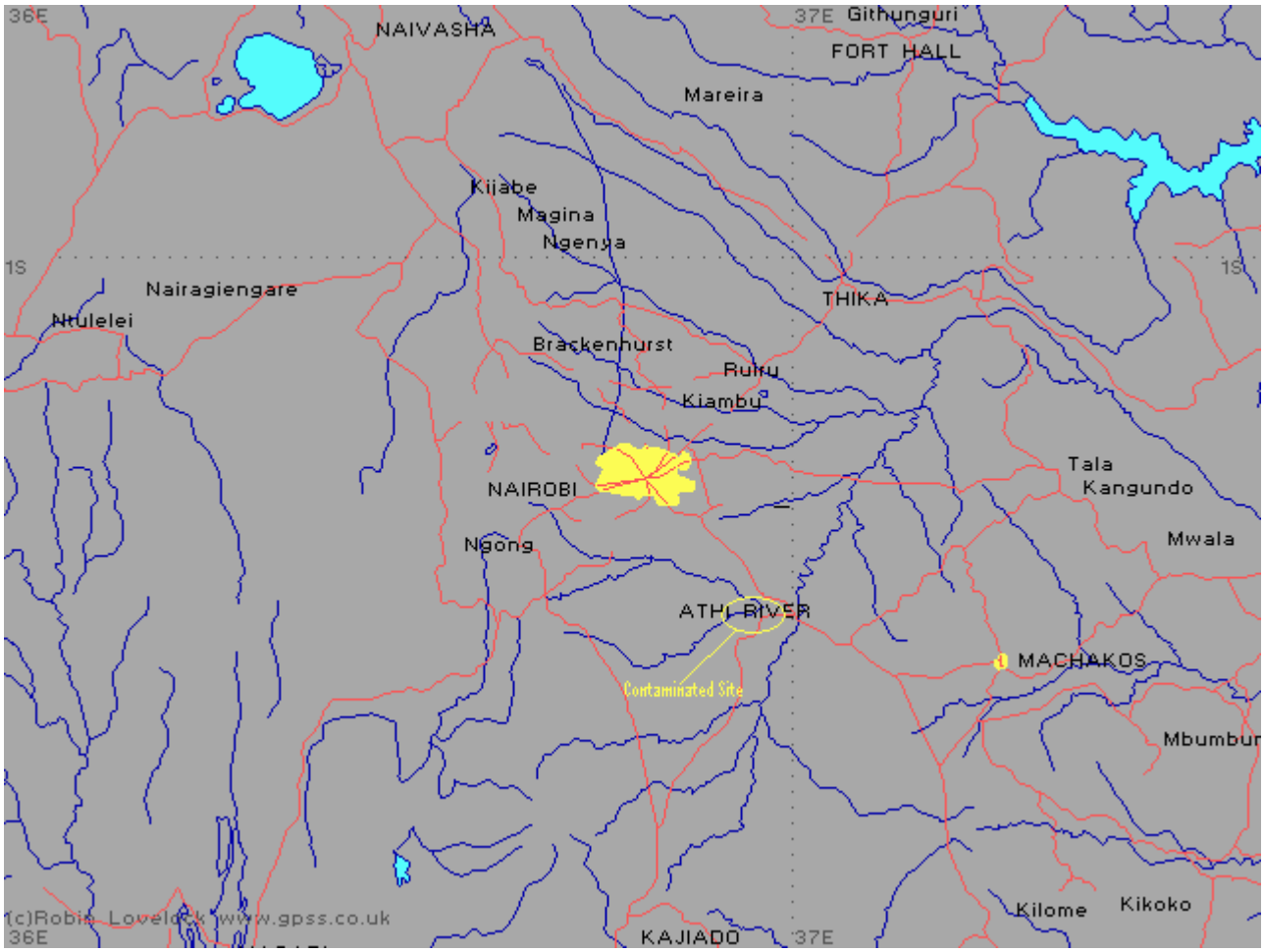
	Common name	Use	Date Banned
1.	2,4,5 T (2,4,5 – Trichloro-phenoxybutyric acid)	Herbicide	1986
2.	5 Isomers of Hexachlorocyclo-hexane (HCH)	Fungicide	1986
3.	Aldrin	Insecticide	2004
4.	Benomyl, Carbofuran, Thiram combinations	Dustable powder formulations containing a combination of Benomyl above 7%, Carbofuran 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 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

RESTRICTED PESTICIDES

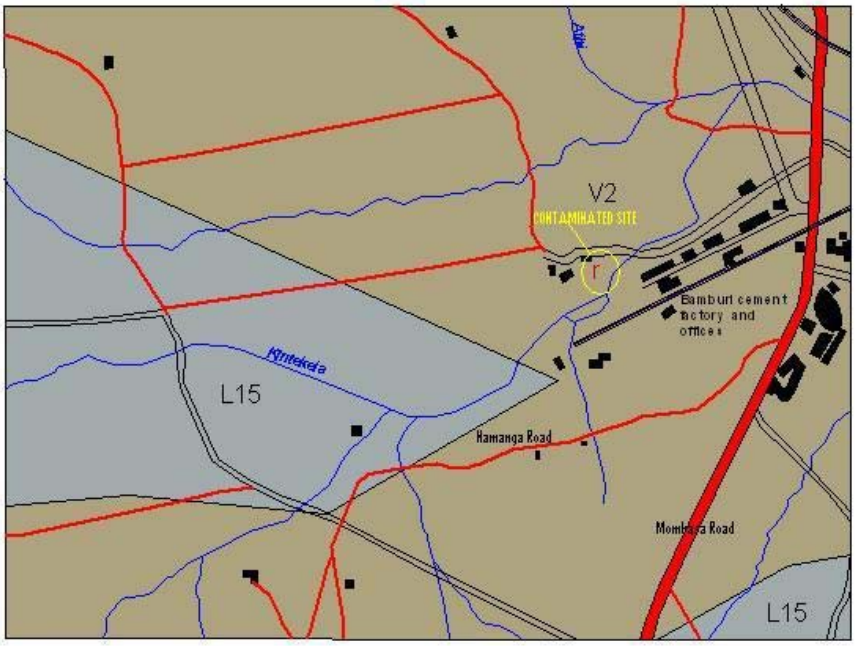
	Common name	**Remarks**
1.	Benomyl, Carbofuran/Thiram combinations	Dustable powder formulations containing a combination of Benomyl below 7%, Carbofuran below 10% and Thiram below 15%
2.	DDT (Dichlorodiphenyl trichloroethane)	Insecticide, restricted use to Public Health only for mosquito control in mosquito breeding grounds 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

ANNEX 3 - MAPS



The contaminated site is circled in yellow.

KITENGELA SITE MAP



Key

r Poi.

All weather road: Bound surface

Main track (motorable)

Dry weatther road

Railway.shp

Rivers

Buildings

Legend

imperfectly drained, moderately deep to deep, very dark grey to black, firm to very firm, slightly calcareous, cracking clay; in many places with a gravelly, calcareous deeper subsoil (pellic VERTISOLS and orthic RENDZINAS)

complex of well drained to imperfectly drained, shallow to moderately deep, dark reddish brown to very dark greyish brown, firm, slightly to moderately calcareous, rocky stony, or gravelly clay

ANNEX 4 - PHOTOGRAPHS

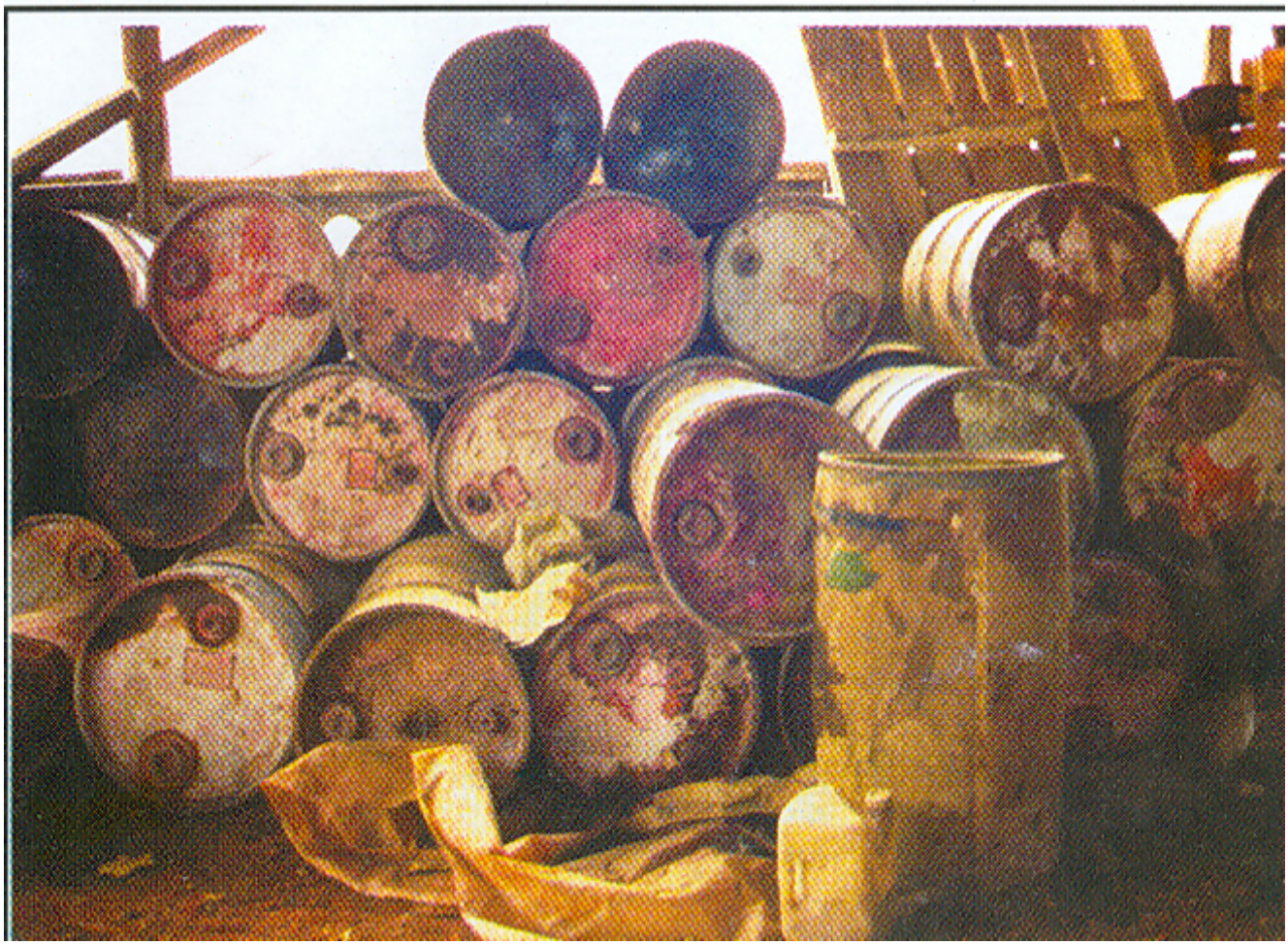
Picture 1

View from the front of the Kitengela Obsolote Chemicals Store, year 2005
Picture by Paul Maina

Picture 2

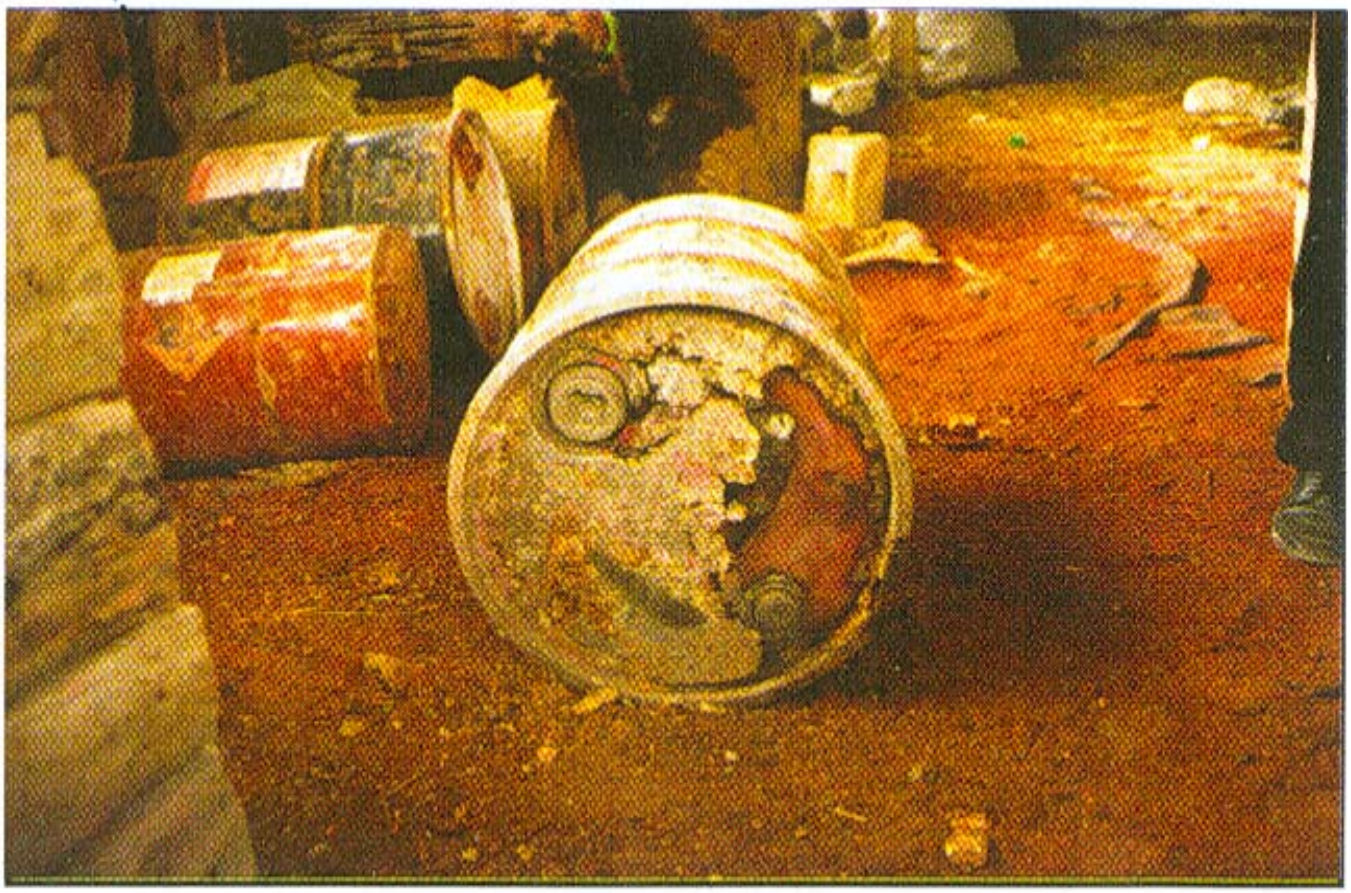
View from the side of the store (2005) Picture by Paul Maina

Picture 3



Condition of store before disposal in year 2000 Picture by NEMA

Picture 4



Notice the dirt floor of the pre-2000 store Picture by NEMA.

Picture 5

Notice leakage from the bottom of the drum (2005) Picture by Paul Maina.

Picture 6

Current state of store (2005) Picture by Rachel Wambui

Picture 7

A drum of Fenthion from DLCO; these chemicals are normally incinerated by KIWM (2005). Picture by Rachel Wambui

Picture 8

The store as it is today (2005) Picture by Rachel Wambui.

Picture 9

Current state of the store (2005); notice the corroded floor and chemical spillage.
Picture by Rachel Wambui