

**NATIONAL CHEMICALS
PROFILE
OF THE REPUBLIC OF
MAURITIUS**

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National Chemicals Profile of the Republic of Mauritius

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Foreword



It is my pleasure to present the National Chemicals Profile of the Republic of Mauritius which has been prepared in collaboration with various stakeholders, including UNDP and UNEP.

While reckoning that chemicals play a vital role in the economic development of every country, we should not ignore the fact that they can contribute to health and environmental hazards.

In fact, it is estimated that more than 25% of the global burden of disease is linked to environmental factors, including chemical exposures.

We need to act at this point in time to put in place the right tools and mechanisms to adequately and safely manage chemicals that may present a problem for our environment now and in the future. Such a consideration is crucial for sustainable development.


In this respect, the Strategic Approach to International Chemical Management (SAICM) is a landmark initiative in international cooperation to protect human health and the environment from the harms caused by exposure to toxic chemical substances.

This strategic approach ensures that chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health. A first step towards Sound Management of Chemicals is the preparation of a national profile of the chemical management infrastructure. To that purpose, the implementation of this Mauritius/UNDP/UNEP initiative has made provision for the production of the National Chemicals profile for the Republic of Mauritius as one of its key deliverables. This document provides an overview of the situation on chemicals management in the Republic of Mauritius, including quantities imported, the legal framework in place, institutions and stakeholders dealing with chemicals in the country.

Furthermore, the findings of this National Chemicals Profile have been the stepping stone to the elaboration of a second document, namely, The National Priorities for the Sound Management of Chemicals: Phased Plan of Action, Economic Analysis and Mainstreaming Road Map. The latter makes provision for integrating all priority activities relating to Sound Management chemicals into government policies, plans and programmes.

This initiative undeniably supports the implementation of the “Maurice Ile Durable” concept which is an innovative strategy aiming at offering the population the best enabling environment for economic development and enhanced quality of life. I am fully confident that this approach will strengthen the Sound Management of Chemicals in Mauritius.

I wish to express my sincere gratitude to UNDP and UNEP for having supported Mauritius financially for the implementation of this initiative and thank all the stakeholders who have contributed to the elaboration of these documents.



Hon Lormus Bundhoo
Minister of Health and Quality of Life

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- Mrs. Roshini Brizmohun, Monitoring and Evaluation Expert
- Members of the Project Steering Committee
- Members of the Dangerous Chemicals Advisory Council (DCAC) and of the Dangerous Chemicals Control Board (DCCB)
- Representatives of private sector
- Representatives of Academia, NGOs and other groups.

The full project management team is included at Annex 1.

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Acronyms

ACIM	Association des Consommateurs de l’Ile Maurice
AFRC	Albion Fisheries Research Centre
APEC	Association for the Protection of Environment and Consumers
APEXHOM	Association Professionnelle des Exportateurs/Producteurs de Produits Horticoles de Maurice
AO	Assay Office
AREU	Agricultural Research Extension Unit
BOI	Board of Investment
CAS	Chemical Abstract Service
CDCU	Communicable Diseases Control Unit
CD	Customs Department
CFCs	Chlorofluorocarbons
Cif	Cost insurance freight
COD	Chemical Oxygen Demand
cSt	Centistokes
CWA	Central Water Authority
DCAC	Dangerous Chemicals Advisory Council
DCCA	Dangerous Chemicals Control Act
DCCB	Dangerous Chemicals Control Board
DDT	Dichloro Diphenyl Trichloroethane
EDC	Extremely Dangerous Chemical
EHEU	Environmental Health Engineering Unit
EOR	Energy Observatory Report
EPZ	Export Processing Zone
EU	European Union
FDI	Foreign Direct Investment
Fob	Free on board
GDP	Gross Domestic Product
GEF	Global Environmental Facilities
GHGs	GreenHouseGases
GIS	Geographical Information System
HCFCs	Hydro Chlorofluorocarbons
HDI	Human Development Index
HPMP	HCFCs Phase out Management Plan
HWI	Hazardous Wastes Inventory
ICP	Institute for Consumer Protection
ICZM	Inter-Coastal Zone Management
IMO	International Maritime Organisation
IPP	Independent Power Producer
IPPC	International Plant Protection Convention
KEMI	Kemikalienspektionenn (Swedish Chemicals Agency)
MARPOL	International Convention for Prevention of Pollution from Ships
MIH	Mauritius Institute of Health
MITD	Mauritius Institute of Training and Development
MIDC	Maurice Ile Durable Commission
MOI	Mauritius Oceanography Institute
MAURITAS	Mauritius Accreditation Service
MCIA	Mauritius Cane Industry Authority
MCCI	Mauritius Chamber of Commerce & Industry
MACOSS	Mauritius Council of Social Service
MFRS	Mauritius Fire and Rescue Service
MQA	Mauritius Qualifications Authority
MEAs	Multilateral Environmental Agreements
MoAIFS	Ministry of Agro-Industry & Food Security
MoEPU	Ministry of Energy & Public Utilities
MoESD	Ministry of Environment & Sustainable Development

MoF	Ministry of Fisheries
MoFARIT	Ministry of Foreign Affairs & Regional Integration & International Trade
MoFED	Ministry of Finance & Economic Development
MoHQL	Ministry of Health & Quality of Life
MoICCP	Ministry of Industry & Commerce & Consumer Protection
MoLIRE	Ministry of Labour, Industrial Relations & Employment
MoLGOI	Ministry of Local Government & Outer Islands
MoPI	Ministry of Public Infrastructure, Land Transport, Shipping & National Development Unit
MoSSRI	Ministry of Social Security, Reforms Institutions
MPA	Mauritius Ports Authority
MPF	Mauritius Police Force
MRLs	Maximum Residue Levels
MSB	Mauritius Standards Bureau
MSW	Municipal Solid Wastes
NCE	National Chemical Expert
NCP	National Chemicals Profile
NDRRMC	National Disaster Risk Reduction Management Centre
NIP	National Implementation Plan
NPF	National Pension Funds
NSIC	National Standard Industrial Classification of all economic activities
NSR	National Situation Report
NTA	National Transport Authority
ODS	Ozone Depleting Substances
OIDC	Outer Islands Development Corporation
OSH	Occupational Safety & Health
OSHA	Occupational Safety & Health Act
OSHI	Occupational Safety & Health Inspectorate
PANeM	Pesticide Action Network Mauritius
PCBs	Poly Chlorinated Biphenyls
PHI	Pre-Harvest Interval
PMO	Prime Minister's Office
POPs	Persistent Organic Pollutants
ppb	parts per billion
ppm	parts per million
PMT	Project Management Team
QSP	Quick Start Programme
RTA	Road Traffic Act
SAICM	Strategic Approach to International Chemical Management
SADC	Southern Africa Development Community
SIDS	Small Island Developing State
SHO	Safety and Health Officer
SLO	State Law Office
SM	Statistics Mauritius
SMF	Special Mobile Force
SMEs	Small and Medium Enterprises
SOLAS	International Convention for Safety of Life at Sea
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNITAR	United Nations Institute for Training And Research
US \$	United States Dollars
UOM	University of Mauritius
UTM	University of Technology Mauritius
VBCD	Vector Biology Control Division
VOCs	Volatile Organic Carbons
WMA	Wastewater Management Authority
ZMWG	Zero Mercury Working Group

Executive Summary

The Strategic Approach to international Chemicals Management (SAICM) is a multi-stakeholder framework encompassing various stakeholders like Governments, international organisations, civil society, private sector and NGOs. The SAICM 2020 goal is to achieve the Sound Management of Chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimise significant adverse impacts on human health and the environment. Through its Quick Start Programme (QSP), SAICM offers technical and financial assistance to countries in economic transition, small island states for their identified SMC activities based on their priorities and actual contexts. In 2010, the Republic of Mauritius embarked on a holistic programme for the Sound Management of Chemicals entitled the Mauritius/UNDP/UNEP Partnership for SA-ICM Initiative funded by the QSP. The project is a cross-sectoral undertaking, which has garnered the participation of key public and private sectors, NGOs, Academia, Research Groups, and other relevant stakeholders and has led to the production of this National Chemicals Profile.

The Republic of Mauritius is a Small Island Developing State comprising of about 1.2 Million inhabitants. Over the years, the main economic sector has shifted from Agriculture, which accounts for only 5% of GDP today. Together, the industrial and services sectors account for 95% of GDP. It is also noted that the employment ratio of Agriculture to Industry to Services was roughly 1:6:13 in 2012, whereby the use of chemicals is prevalent in various economic sectors, which thus calls for the Sound Management of Chemicals.

As local primary production of chemicals is practically inexistent, the country depends on imported chemicals, which are brought in through maritime transport. Petroleum products represent more than 80 % of these imports by weight, and about 70 % of the monetary value for all clusters. Users of chemicals are scattered around the island necessitating road transportation for distribution and storage, except for those chemicals used in the outer islands. Approximately 16 800 tons and 252 m³ of hazardous wastes are generated yearly though local means of disposal are not adequate.

The use of chemicals and the generation of hazardous wastes cause a number of impacts on the environment, human health and society as well. Water pollution and air pollution arising due to heavy uses of chemicals remain the highest environmental concerns. Food contamination from chemicals or their residues and exposure to chemicals, especially at the workplace, are the main health concerns. In addition, misuse of chemicals through assaults on other individuals, suicides or abuses, in the case of illicit drugs, are also noted. It is noted that 89 cases of deaths due to chemicals were recorded in 2011. In 2012, about Rs 42 M were paid in compensation for industrial accidents by the Ministry of Social Security. This can be compared to about Rs 23 M in year 2003.

The Dangerous Chemicals Control Act (DCCA) is the principal legislation dealing with the management of chemicals in Mauritius. In addition the Occupational Safety and Health Act and the Environment Protection Act are the two other pillar legislations as regards chemicals management in Mauritius. While the legislative framework is in place, there remain gaps in their implementation. For instance, there is still a need for proper labelling and adequate measures to be taken in the context of retail trade of chemicals or management practices concerning chemical wastes.

The SAICM National Focal point lies within the Ministry of Health & Quality of Life (MoHQL) which also has many other heavy responsibilities. Other Governmental institutions are enforcing or regulatory authorities in specific fields related to the management of chemicals such as the Ministry of Labour, Industrial Relations & Employment (MoLIRE), the Ministry of Environment and Sustainable Development and the Ministry of Civil Service & Administrative Reforms which has a department dedicated to the field of OSH, i.e. addressing all matters pertaining to chemical hazards at work. While there are many governmental inter coordination mechanisms such as the DCCB and MID, there remains a need to improve enforcement.

In addition to the Government institutions, the role of civil society should not be underestimated in terms of providing training to manage chemicals or raising awareness. The University of Mauritius is a good example representing Academia and Research groups through its responsibilities as a tertiary education and contractual services. The NGO PANEM is actively

involved in awareness raising on chemicals, and has participated in international projects for the SMC. Similarly, a few industry groups have been active in promoting advocacy and best practices such as Croplife Mauritius. However, it is notable that the private sector initiatives through umbrella organisations like MCCI, AMM, etc. seem to be lacking in this sector.

The report also deals in depth with coordination mechanisms in relation to the chemicals sector and which are mentioned in the DCCA, namely the Dangerous Chemicals Advisory Council (DCAC), the Dangerous Chemicals Control Board (DCCB) and the Enforcing Agencies Coordination Committee (EACC). There also exist other coordinating mechanisms related to chemicals such as the Advisory Council on OSH under the MoLIRE. However, for better representation within these committees, it is desirable that unrepresented stakeholders could also have their voices heard fostering inter-stakeholder dialogue, for e.g. the civil society, consumer groups or workers' union, etc.

Owing to the large number of stakeholders in this sector, it is essential that there be sharing of data and information on chemicals management in order to achieve the objectives of SAICM. At the local level, all entries of chemicals are recorded by the Customs Department. However, as regards data on use and disposal, i.e. the remainder of the life cycle, there is a lack of consistent recording and reporting as it is not mandatory. Thus, there exist gaps in terms of the availability of data from stakeholders, and in addition, there is no common platform to share results of laboratory while the private sector is also not under any obligation to share data. However, at the international level, Mauritius is party to a number of conventions which have regulatory and other mechanisms to manage chemicals at the global scale such as the Basel, Rotterdam, and Stockholm and more recently, the Minamata Conventions and which require data sharing and regular reporting.

Management of chemicals implies that there is the necessary infrastructure to analyse them namely laboratories and to improve knowledge about them namely the educational system. Not all Governmental institutions possess testing laboratories and their capacities vary in terms of the chemical parameters accredited, types of samples analysed, and equipment available. It is desirable that a national laboratory management policy be adopted in the future, as the public testing laboratories are many a times not able to offer their services to the public. Academic courses offered by two public Universities have modules and topics deemed relevant to the SMC thereby ensuring availability of the future trained workforce in this sector.

Sound Management of Chemicals is also about raising awareness about the impacts of chemicals on human health and the environment. It is notable that Governmental and non-governmental institutions are playing a significant role in the management of agrochemicals. For example, much is being done by the Agricultural Research Extension Unit (AREU), under the Ministry of Agro Industry and Food Security, which has produced several publications and offers training programmes for different target audiences. In this context, it is recommended that awareness and training must be imparted for other categories of chemicals especially for consumer chemicals.

The lack of resources available to the governmental institutions acting as enforcing agencies affects the enforcement capabilities. There is no specialised organisation which exists in Mauritius and which deals only with chemicals management. Therefore, the existing governmental institutions possess varying number of staff designated to manage chemicals but who may also be responsible for other activities. Although there is a lot of professional training, workshops and seminars conducted at national level, it is deemed that there is also a need for additional training for a better SMC regime as inaction can result in a lot of impacts and costs to the country.

The final recommendations reflect the nine high level priorities through the Mauritius UNDP/UNEP partnership initiative. One of the objectives of the SAICM project is to mainstream the recommendations into national policies and action plans such as Maurice Ile Durable and the Economic and Social Transformation Plan thereby leading to the Sound Management of Chemicals, ultimately leading to the achievement of the SAICM 2020 goals.

Introduction

The Mauritius SAICM Initiative

Mauritius has graduated to a middle-income economy status since the 1990s. The economy has been growing at an annual rate of 4.2% from 2006 to 2012; the GDP per capita at market prices has grown by 55% for the same period. Mauritius has a long record of sustainable growth over the last 45 years of independence. Prudent macro-economic management, political stability, favourable regulatory and institutional arrangements, investment in human capital development, an entrepreneurial culture and a developed financial system have led to a resilient economy with high growth and growing affluence that have been reasonably well spread in the population. The country has been able to shift from an agricultural-based economy to an economy driven by the services, tourism hospitality and industrial sectors.

For the smooth running of the economy, it is highly dependent on chemicals which must be imported for the various applications, as it does not possess exploitable resources like natural gas, petroleum, coal, etc. Various Governmental institutions are entrusted with responsibilities which are directly and indirectly related to chemical management in the country. Moreover, different legislations have been enacted for this purpose. The main one being the Dangerous Chemicals Control Act 2004, a thorough piece of legislation covering various aspects of chemicals. It is complemented by other legislations related to other chemical substances like inflammable liquids, fertilisers, cosmetics, drugs, etc.

In 2010, the Republic of Mauritius embarked on a holistic programme for the Sound Management of Chemicals entitled the Mauritius/UNDP/UNEP Partnership for SAICM Initiative funded by the QSP. The project is a cross-sectoral undertaking which has garnered the participation of key public and private sectors, NGOs, Academia, Research Groups, and other relevant stakeholders, implemented by the Ministry of Health and Quality of Life and supported by the UNDP and UNEP.

Strategic Approach to International Chemicals Management (SAICM) Programme

Various Multilateral Environmental Agreements (MEAs) and other mechanisms put in place at international level have been devised for SMC since the last few decades. Among them is one which is specifically concerned with chemicals is the Strategic Approach to International Chemicals Management (SAICM). Adopted in 2006, at the first International Conference on Chemicals Management (ICCM), SAICM is a non-legally binding international framework regulation, which has set a highly determined goal. The SAICM 2020 goal is to achieve the Sound Management of Chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimise significant adverse impacts on human health and the environment.

SAICM is a multi-stakeholder framework encompassing various stakeholders like Governments, international organizations, civil society, private sector and NGOs. Through its Quick Start Programme (QSP), SAICM offers technical and financial assistance to countries in economic transition, small island states and Least Developed Countries (LDCs) for their identified SMC activities based on their priorities and actual contexts. One of the pre-requisites of the QSP is that countries must develop and update their own National Chemical Profile (NCP) which is a technical document describing various aspects related to SMC such as use of chemicals, applicable laws or institutions managing chemicals throughout their life-cycle.

Structure of the Report

Chapter 1 - National Background Information

This Chapter introduces the Republic of Mauritius and includes descriptions of its geographical position, regions, political and administrative structure. It then provides details on the Main Economic Sectors and Employment, sections bearing a more direct relation with the management of chemicals.

Chapter 2 - Chemical Production, Trade, Transportation, Use and Disposals of Chemicals

This Chapter sets the stage for discussion about how chemicals are being used in Mauritius. It is a key Chapter in terms of data on chemicals, classified in terms of categories according to their intended uses. It also relates the challenges of having quantitative data on chemicals management

Chapter 3 - Challenges and Priority Concerns on the Management of Chemicals

In this Chapter, the challenges pertaining to the various uses of chemicals, in Mauritius, throughout their life cycle are presented. It relates all problematic issues like pollution, food contamination, health problems and even causes of death due to contact with or exposure to chemicals.

Chapter 4 - Legal Framework for the Management of Chemicals

Chapter 4 describes the legal framework for the management of chemicals in Mauritius. The principal functions of the Dangerous Chemicals Control Act (DCCA) are described as well as other connected legislation.

Chapter 5 - Institutional Framework for the Management of Chemicals

This Chapter has a direct link to the previous one, as Governmental institutions mandated by the respective legislations to manage chemicals are presented as well as the roles and responsibilities including relevant activities of Ministries and their parastatal organisations on the management of chemicals are described. These institutions being official enforcing or regulatory authorities are called upon to achieve the Sound Management of Chemicals (SMC).

Chapter 6 - Role of Civil Society for the Management of Chemicals

In this Chapter, a multi-stakeholder approach is depicted, as the Governmental institutions are not the only ones involved in the SMC. In this respect, the existence and activities of such stakeholders are described. These institutions and their activities are different but they can ultimately diverge to common aims like having trained, skilled and conscious individuals to manage chemicals in better ways.

Chapter 7 - Inter-Ministerial Coordinating Mechanisms for the Management of Chemicals

The Chapter 7 is an extension to Chapter 5 as it also describes institutions involved in the management of chemicals in Mauritius. This Chapter also highlights shortcomings, which need to be addressed for an effective and pro-active approach for the management of chemicals by local stakeholders.

Chapter 8 - National Data and International Linkages for the Management of Chemicals

This Chapter reviews available national data on chemicals and secondly all affiliations of the Republic of Mauritius towards international institutions like the United Nations agencies, Regulatory and Non-regulatory mechanisms, which manage chemicals at global levels.

Chapter 9 - Technical Infrastructure for the Management of Chemicals

This Chapter provides an overview of the chemical laboratories of various public institutions, and secondly, an overview of the technical education available is summarised. The section on laboratories also depicts their capacities such as the chemical parameters accredited, types of samples analysed, equipment available, etc. including a textbox to highlight affordability constraints for laboratory chemicals.

Chapter 10 - Awareness and Understanding of Workers and the Public on the Management of Chemicals

This Chapter relates to the role of institutions in providing awareness on chemicals management so that workers and the public at large can become more conscious about risks posed to their own health and to the environment by using chemical substances.

Chapter 11 - Resources for the Management of Chemicals

Emphasis is laid in this Chapter on the human resources as without the right pool of skilled and trained professionals, the whole mechanism can become inefficient. No specialised Chemicals agency exists in Mauritius as of January 2014, and the existing Ministries have variable number of staff designated to manage chemicals at different stages of their life cycle.

Chapter 12 - Overall Conclusions and Recommendations

The overall conclusions and recommendations are presented taking into account the Mauritian context and specificity. The Overall Conclusions reflect the nine high level priorities identified in the National Plan of Action for the SMC i.e. another deliverable of the Mauritius SAICM Initiative.

Consequently, it is expected that the NCP turns out to be a useful tool and a starting point for implementing, strengthening or introducing activities pertaining to chemicals in Mauritius, enabling it to meet with the SAICM 2020 goal. The NCP can help in identifying capacity building needs on various areas pertaining to the uses, labeling, transport, storage or disposals of chemical substances. Moreover, through the NCP, international institutions offering technical assistance or training on specific areas such as the Globally Harmonised System for the Classification and Labelling of chemicals (GHS) [2] would obtain a baseline data on the status of the management of chemicals in Mauritius. It must be stated that national activities pertaining to the Sound Management of Chemicals are in line with UN MDG 7: Ensuring Environmental sustainability.

Chapter 1

NATIONAL BACKGROUND INFORMATION

Mauritius is situated 890 km to the east of Madagascar, between 19°50' and 20°32' of South Latitude and 57°18' and 57°46' of East Longitude. Reunion, a French island, is 200 km south west from Mauritius and Rodrigues, an island forming part of the Mauritian territory, 600 km to the East North East from Mauritius.

Of volcanic origin, these islands separated by sea pits of 4,000 metres deep, have emerged from the abysses as a result of underwater volcanic eruptions that happened thousands of kilometres to the east of the continental block made up by Africa and Madagascar. Independent since 1968, it is a sovereign Republic constituted of the main island, bearing the name of Mauritius, outer islands namely Rodrigues, Agalega, St Brandon (Cargados Carajos Archipelago), Chagos Archipelagos and Tromelin, as well as several uninhabited islets within the Indian Ocean. Two inhabited outer islands namely Rodrigues and Agalega are both connected by air and by sea from Mauritius. In 2013, the midyear human population of the Republic of Mauritius is estimated at 1 295 789.

After general elections in 1967, Mauritius adopted a new constitution and independence was proclaimed on 12 March 1968. Mauritius achieved the status of Republic 24 years later on 12 March 1992.

1.1 PHYSICAL AND DEMOGRAPHIC CONTEXT

This section gives an overview of the physical and demographic features of the Republic of Mauritius.

Table 1.1: Key features of the Republic of Mauritius
The Republic of Mauritius in facts and figures
Size of Mauritius island : 1 865 km ²
The total terrestrial surface area of the Republic Mauritius i.e. with outer islands and islets included amounts to 2040 km ² . Being surrounded by seas, its total Exclusive Economic Zone (EEZ) is almost 1.9 million km ²
Type of government : Parliamentary democracy
Mauritius is a free and democratic state since 12 March 1968 and became a Republic in 1992. The Honourable Prime Minister has the leadership of the Government and at the Parliament, while the Honourable President of the Republic is the Guardian of the Constitution of Mauritius.
Official Language : English
The medium of instruction within all levels of the education sector is mostly in English, there are a few exceptional cases of French medium institutions. French is also a business language and is commonly used in most print media. The majority of places within Mauritius bear French names.
¹ Population : 1 295 789
The island of Mauritius had a population of 1 257 121 and outer islands had a combined population of 38 668 as of 01.07.2013. The median age of the population was 34 (2012)
¹ Crude birth rate : 10.7 per 1 000 inhabitants (mid 2013)
In 2012, the number of live births was 14 492 and number of still-births was 140. Infant mortality rate was 13.7 per 1 000 live births (2012)
Life Expectancy : 74.7 years (2011)
In general, women live seven years longer than men. Life expectancy at birth was 77 years for women and 70 years for men (2011)
Literacy Rate : 89.8 % (2011)
35% of the population possessed at least a School Certificate in 2011. As at March 2012, the enrolment of pupils in schools and colleges was 113 634 at primary level and 115 667 at secondary level respectively, while the tertiary level enrolment was 45 969 (2011)
Population of working age : 16 - 65 years
³ Out of 993 500 people, 593 100 constituted the labour force i.e. an activity rate of 59.7% of the population in 2012. The workforce actually concentrated in the age group of 30 to 50 years. The mean age of a male and a female worker was 40.4 years and 39.1 years respectively.
Unemployment Rate : 8.1 % (2012 estimate)
³ The rate was higher among women (12.7%) than among men (5.3%). In terms of numbers, there were 19 700 unemployed men and 28 600 unemployed women (2012)
Gender distribution: For every 100 women, there were 97 men in 2011.
⁴ Percentage of women constituting labour force : 38 % (including foreign female workers)

¹ Population Vital Statistics, RM, January – June 2013, Statistics Mauritius

² Digest of Education statistics, 2011 Statistics Mauritius

³ Continuous Multi-Purpose Household Survey during the year 2012, Statistics Mauritius

⁴ Digest of labour statistics, 2011 Statistics Mauritius

1.1.1 Regions of Mauritius

The Republic of Mauritius is divided into nine districts; Rodrigues was previously the 10th district of Mauritius until it was granted its autonomy in 2002. In 2011, the urban population stood at 499 349 while the rural population was 697 034. Port Louis, the capital city, is the main economic hub of the island with its port directly connected to several other ones in Africa, Asia and the Middle East.

Figure 1.1: Map of Mauritius

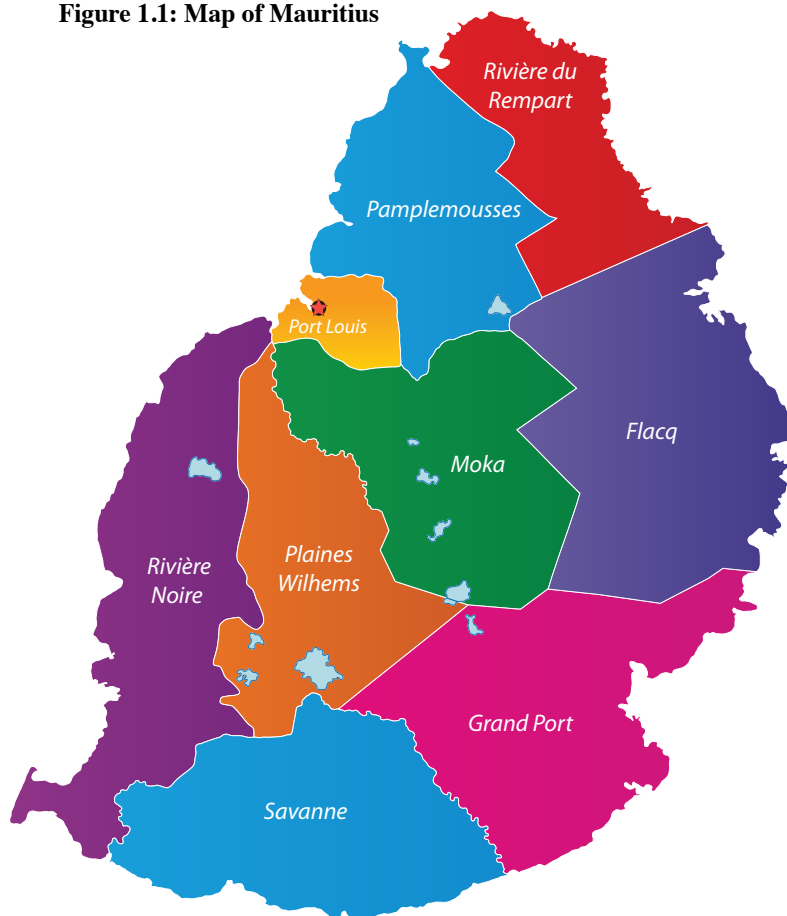


Table 1.2 gives a brief overview of the demography of the districts, towns and main villages of the Republic of Mauritius

Table 1.2: Major Regions and Estimated Populations							
Districts					Towns (T) / Main Villages (V)		
Name	Population	Position on the island	Area (km ²)	Population density (km ²)	Name	Population	Area (km ²)
Black River	76 605	West	259.0	301	Beau Bassin/Rose Hill (T)	103 608	20.2
Flacq	135 406	East	297.9	473	Curepipe (T)	77 471	24.0
Grand Port	110 907	South-East	260.3	445	Port Louis (T)	137 608	46.7
Moka	82 301	Central & Eastern	230.5	354	Quatres Bornes (T)	75 613	25.5
Pamplemousses	136 268	North	178.7	780	Vacoas / Phoenix (T)	105 559	54.2
Plaines Wilhems	362 292	Central	263.3	1900	Centre de Flacq (V)	17 996	² n/a
Port-Louis	118 431	North-West	42.7	2998	Goodlands (V)	21 348	n/a
Rivière du Rempart	106 267	North	147.6	744	Mahebourg (V)	17 095	n/a
Savanne	67 906	South	244.8	288	Triolet (V)	24 147	11.3
Total	1 255 020		1 865	654			

Sources: Digest of Demographic Statistics 2011, Statistics Mauritius

¹ Both towns and villages form part of respective districts

² Not available

1.2 ADMINISTRATION AND POLITICAL STRUCTURE

The Central Government is composed of a Cabinet of Ministers under the leadership of the Honourable Prime Minister and is composed of 24 Ministries in 2013. Moreover, the Local Government of Mauritius is composed of the District Councils, Municipal Councils, and Village Councils for the day to day administration of the regions within the country. Municipal and village elections are also held after each five years.

1.3 REGIONAL STRUCTURE AND INTEGRATION

1.3.1 Rodrigues and Outer Islands

In addition to the main island of Mauritius, the Republic of Mauritius is composed of Rodrigues and Outer islands. Except for Rodrigues, the outer islands are managed by the Outer Islands Development Corporation (OIDC) a body corporate of the Government of Mauritius. Further descriptions of the three main islands are as follows:

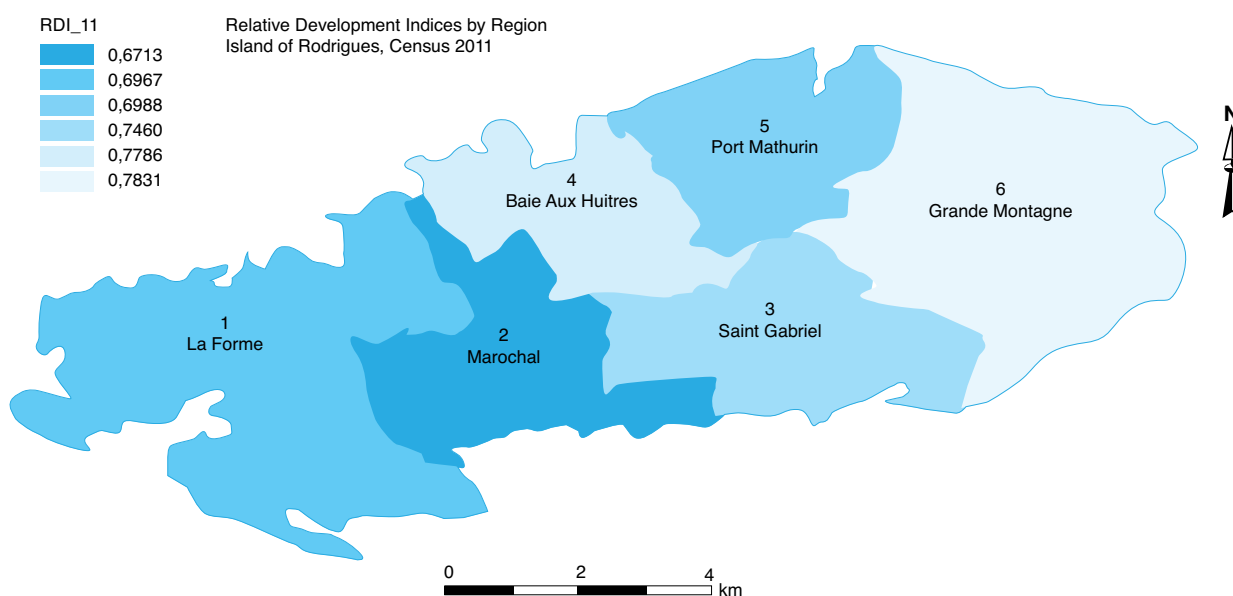
(a) Rodrigues

Officially discovered in 1691, the island of Rodrigues, is located 560 km north-east of Mauritius, with an area of 104 km². It is connected to the latter by sea through Port-Mathurin, its main locality which is also considered as its capital. The island is sub-divided into six main regions including the capital.

Airline connection with the island of Mauritius exists since about 25 years when an airport came into operation at Plaines Corail. As of January 2014, there are two daily flights between Mauritius and Rodrigues.

In October 2002, Rodrigues was granted Autonomy for running its own administration and is now constituted of the Rodrigues Regional Assembly (RRA) consisting of an Executive Council with the Chief Commissioner at its head. However, the whole island is still under the official jurisdiction of Mauritius. According to Statistics Mauritius, 2 727 persons were employed under the RRA as at March 2012.

Figure 1.2: Map of Rodrigues



Source: Statistics Mauritius

Living conditions in Rodrigues have been gradually improving since the past few decades. Its inhabitants have more access to public facilities such as telecommunications, health services or education. Agriculture and fishing are its main economic activities while the tourism industry has also started to develop since the past 20 years. Its population was 40 434 in 2011, increasing by 13 % from 2000 to 2011 while its population density is 389 km² (2011).

(b) Agalega

Agalega consists of two small islands located 1 000 km from Mauritius. The infrastructure is very basic and consists of a simple road network made up of corals and sand. It has no seaport or airport but a landing strip for light aircrafts and a jetty for ships coming from Mauritius for replenishment of resources required by the local inhabitants.

Agriculture, mainly coconut plantation, and artisanal fishing are the only routine activities therein. The island has limited power generation using diesel generators.

(c) St Brandon

It is an island located 450 km from Mauritius. There are no permanent residents on the island but it is used to conduct research and meteorological purposes by the Meteorological Services Department and other stakeholders. The island may also be visited by tourist boats.

1.3.2 Regional Cooperation

Due to its geographical position, the Republic of Mauritius has diplomatic commitments towards regional economic groups in which it forms part of since its independence. As of January 2014, Mauritius is a member state of the following regional frameworks:

- Indian Ocean Commission (IOC)
- Indian Ocean Rim Association for Regional Cooperation (IOR-ARC)
- Southern African Development Community (SADC)
- Common Market for Eastern and Southern Africa (COMESA)
- African Union (AU)

The list of conventions and treaties to which Mauritius is a party is available on the website of the Ministry of Foreign Affairs.

1.4 MAIN ECONOMIC SECTORS

The Mauritian economy is growing at a rate of 3.2 % as mentioned in the 2013 National Budget. The rate of inflation achieved a figure of + 3.9 % in 2012. The country does not have major exploitable resources like coal, ores, petroleum, natural gas or minerals. Accordingly, it has to rely much on imports of major commodities as well as raw materials for its manufacturing sector. The contributing sectors to the Mauritian economy are given in Table 1.3.

Table 1.3: Contribution to GDP at basic prices sectorwise			
Sector	% in 2010	% in 2011	% in 2012
Manufacturing	17.0	16.9	16.7
Public administration, education, health	14.1	14.2	14.2
Wholesale & retail services (including transport, repairs and storage)	11.7	11.8	12.2
Financial and Insurance services	10.1	10.2	10.3
Hotel & Hospitality services	7.0	7.1	7.0
Construction	7.0	6.6	6.3
Real estate activities	5.4	5.5	5.5
Agriculture	3.6	3.6	3.4

Source: Digest of Agricultural Statistics 2011, Statistics Mauritius

1.4.1 Agricultural sector

The agricultural sector led by the sugar cane industry (1.6 % GDP in 2011) was one of the major contributors to the economy till the early 1990s. Although the sugar cane industry has a historical importance in Mauritius, there has been a gradual reduction in the area (less than 60 000 hectares in 2013) under sugar cane cultivation accompanied by a centralisation of the sugar industry.

As the sugar cane industry exists since more than two centuries, it has been invariably the main consumer of chemicals in Mauritius for many years. The industry needs to be competitive and sustainable so that the sugar produced can reach highly demanding markets like the European Union (EU). An average output of 4 298 001 tons of sugar cane harvested for the years 2010 and 2011 cultivated over 58 668 hectares of land yielding an average of 443 892 tons of sugar. For 2011 alone, the exported sugar was estimated at a value of MUR 9 501 million.

With the gradual diversification of agricultural production, the country has many small-scale planters and farmers operating on their own or through co-operative societies as well as some private agricultural companies in different regions. Among the agricultural produce which is also export oriented are found crops like tea, seasonal fruits, flowers and even some ornamental leaves. Production of fruits and vegetables is also intended for the local market and usually conducted by various means e.g. open plantations, orchards, greenhouses or home-gardening. Being sold in retail, it is normally easy to obtain agricultural products like seeds, plantlets as well as agricultural chemicals in Mauritius.

According to the Digest of Agricultural Statistics 2011 published by Statistics Mauritius, the production of non-sugar crops reached 115 934 tons for a total cultivated area of 7 483.8 hectares. The districts of Flacq and of Savanne normally represent the highest ones in terms of non-sugar agricultural production. Table 1.4 gives a picture of the non-sugar crop production in Mauritius for 2011.

Table 1.4: Production of selected non-sugar crops (tons)											
Region	Beans & Peas	Potato	Maize	Ground-Nut	Onion	Tomato	Cabbage & Cauliflower	Creepers	¹ Others	Banana	Pineapple
Black River	71	538	1	² n/a	2 382	978	614	796	1 391	673	135
Flacq	547	643	98	259	1 289	2 106	684	4 533	604	3 605	8 213
Grand Port	199	2 335	6	2	158	2 182	508	3 251	1 450	825	15
Moka	286	2 617	55	13	18	845	1 469	4 079	1 241	909	558
Pamplemousses	147	628	51	47	185	1 518	253	3 729	2 271	232	1 829
Plaines Wilhems	242	1 737	n/a	10	1 080	1 010	2 842	5 429	4 926	221	n/a
Port-Louis	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rivière du Rempart	94	1 488	19	40	33	1 472	126	3 901	220	92	162
Savanne	110	11 575	89	137	96	1 243	271	3 022	446	3 987	10
Total	1 696	21 561	320	499	5 241	11 354	6 767	28 798	12 549	10 544	10 922

Source: Digest of Agricultural Statistics 2011, Statistics Mauritius

¹ Other vegetable crops including beet, carrot, broccoli, ladyfingers, manioc, sweet potato, lettuce, asparagus, etc.

² not available as the crop may not be cultivated in that region

1.4.2 Sea-food hub sector

The sea-food hub sector has slowly become an important economic sector of the Republic of Mauritius, it can be considered as a sub-sector of the agricultural sector. The country has an Exclusive Economic Zone (EEZ) of 1.9 million km² enabling fishing activities at high seas. Tuna is the most caught fish being destined for exportation. Some types of fish, crustaceans and molluscs are also caught through artisanal fishing. Moreover, certain coastal areas of the country also witnessed the creation of marine farms since the late 1990s. According to the Digest of Agricultural Statistics 2011, the total fish production reached 5 339 tons wherein 2 189 tons were fresh coastal fish catch in 2011. For the same year, it was estimated that the total exports (f.o.b.) for fish and fish preparations was MUR 9 592.2 million. This sector is usually threatened due heavy uses of chemicals in agriculture and industrial applications or marine transport accidents since run-offs and spills can easily pollute waters and affect the quality of the sea-food products.

1.4.3 Services Sector

In view of reducing its dependence on the agricultural sector, the country experienced a shift towards industrial and services sector. Accordingly, the hotel industry emerged to become a major pillar of the economy since the 1970s whereby it became a major service provider in the following decades. In parallel, the national aviation company increased its fleet and number of destinations. Simultaneously, access to operate was also granted to other airline companies and all these developments led to the gradual increase in the number of tourists. The number of tourists' arrival in Mauritius was 400 526 in 1994 compared to 965 441 in 2012. With the upgrading of the International Airport in 2013, the receipts from the tourism sector are expected to reach MUR 47 000 million.

After the creation of the hotel and hospitality industries, the services sector has gradually diversified with the help of governmental policies, to include new sectors such Banking, Finances, Insurance, Enterprise Resource Planning (ERP) or Information & Communication Technology (ICT) – Business Process Outsourcing (BPO). Since the last decade, Mauritius has also witnessed more foreign investments due to the creation of a few local institutions facilitating trade and business. In 2011, the country attracted MUR 9.5 Billion of Foreign Direct Investment (FDI) which mostly originated from the European Union. [4] The services sector is becoming an increasingly heavy consumer of chemicals for instance hotel industry uses chemicals for water purification during cleaning of swimming pools or the various printing companies heavily depend on inks and organic solvents.

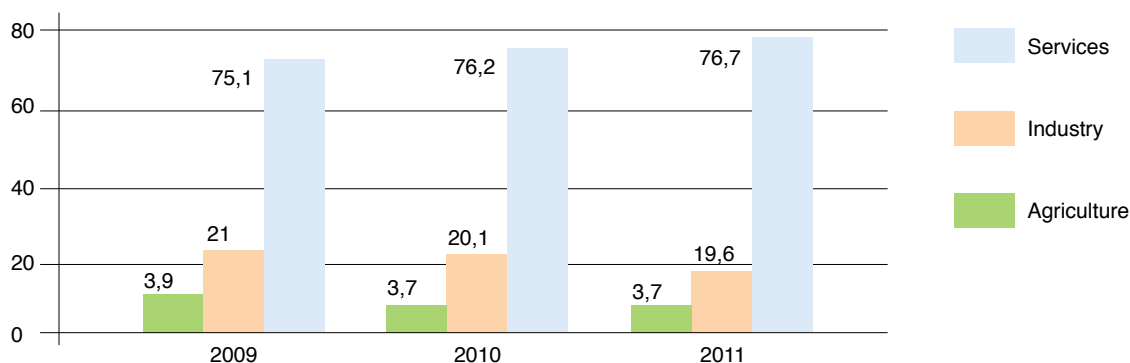
1.4.4 Industrial sector

Within the same period that the hotel industry took off, new manufacturing industries began their operations. The products of these new industries were export-oriented and constituted mainly of clothing, apparel and footwear. In fact, the textile industry was the main industry in the Export Processing Zone (EPZ) sector. Due to its success, the textile sector has also been able to set up production units out of Mauritius for instance in Madagascar and Bangladesh. As a result of the industrial development which took place, Mauritius saw the emergence of industrial zones in different regions which created thousands of direct and indirect jobs.

Changes have also been noted in the industrial sector, as it has been gradually shifting from a traditional textile industry to one that produces several new types of goods for the local market and for exportation. Some new products being manufactured are animal feeds, building materials, industrial gases, metallic frames and castings, glass-fibre water tanks and consumer goods like soaps and detergents. There are also some highly specialised products being manufactured locally but destined for exportation for e.g. catheters used as cardiac implants. As would be found in the next Chapter, many of the manufacturing units employ chemicals in their processes.

Figure 1.3 shows a graphical representation of the three contributing sectors to the Mauritian economy.

Figure 1.3: GDP Contribution of the main sectors of the economy



Source: Digest of Agriculture Statistics, Statistics Mauritius 2011

1.5 EMPLOYMENT

Mauritius has a bilingual workforce which constitutes a major asset for local and multinational companies seeking to do business within the country. With most of the administrative offices of the governmental institutions and of the private sector companies located in Port Louis and Plaines Wilhems, the latter districts represent the main poles for employment in Mauritius. Consequently, there is a massive flow of human, goods and logistics movement towards and within these two districts on normal working days. On the other hand, employment in the other regions is concerned with the agriculture, fishing, hotel, real estate sectors mostly. As of 2013, the rate of unemployment in the country is 8.9 %.

Table 1.5 gives an overview of the sectors further in terms of their contribution to the GDP of the economy in 2011.

Table 1.5: Economic Sectors and Contribution to GDP		
Sector	Contribution to GDP (Million MUR)	Major products
Industrial/Manufacturing	55 897	Clothing & apparels Footwear Foodstuffs Furniture Plastic products
Agriculture	10 449	Sugar Tea Tropical Fruits Vegetable crops Fresh Flowers Seafood
Services & others	218 917	Hotels Financial Business Insurance ICT
Total	285 263	

Source: Digest of Industrial Statistics 2011, Statistics Mauritius

The services sector is the most significant contributor to the economy and employs about two-thirds of the labour force in Mauritius. The breakdown of the major economic sectors in terms of the size of enterprises and respective number of employees is given in Table 1.6.

Table 1.6: Structure of enterprises and workforce, sectorwise as at March 2012								
Sector: Manufacturing			Sector: Agriculture, Forestry & Fishing			Sector: Services & Others		
¹ Size of enterprises	Number of enterprises	Number of employees ²	¹ Size of enterprises	Number of enterprises	Number of Employees ²	¹ Size of enterprises	Number of enterprises	Number of Employees ²
1 to 9	0	0	1 to 9	45	201	1 to 9	78	473
10 to 49	390	9 286	10 to 49	91	1 971	10 to 49	1 139	24 636
50 to 99	108	7 355	50 to 99	14	1 002	50 to 99	293	25 713
100 to 299	106	17 404	100 to 299	20	3 701	100 to 299	225	20 638
300 to 499	15	5 653	300 to 499	2	777	300 to 499	60	26 524
500 to 999	14	9 484	500 to 999	5	3 253	500 to 999	35	24 354
>1 000	13	23 899	>1 000	1	1 014	>1 000	18	27 481
Total	646	73 081	Total	178	11 921	Total	1 848	156 705

Table 1.7 shows an overview of employment and industrial activities according to pre-defined sectors. It would be noted that the food products and textile & apparels account for the biggest two manufacturing sectors and their products are intended both for local markets and for exportation

Table 1.7: Overview of employment and industrial activities				
¹ NSIC	Description of activities	² Number of facilities	Number of employees	³ Output value MUR Millions
5 – 9	Mining and quarrying	27	1 125	2 929.5
10 -32	Manufacturing of:	666	74 100	126 880.0
10	Food products	107	10 619	37 483.5
11	Beverages	15	2 510	11 710.3
13	Textiles	38	4 641	6 964.8
14	Wearing apparel	172	38 678	26 282.5
15	Leather and related products	13	703	497.4
152	Leather footwear	7	175	125.8
16	Wood, corks	13	565	153.0
17	Paper and paper products	15	630	1 492.7
18	Printed and recorded media	37	2 055	3 649.9
19 – 21	Chemical related products including pharmaceutical products	33	2 242	6 286.2
22	Rubber and plastic products	35	1 315	3 739.6
23	Other non-metallic mineral products	14	1 191	2 506.8
24	Basic metals	5	508	1 150.0
25	Fabricated metal products (excluding machinery & equipment)	53	2 052	2 570.1
26	Computer, electronic and optical products	13	1 423	1 260.5
27	Electrical equipment	7	292	4 47.9
28	Machinery and equipment	3	251	946.1
29 -30	Motor vehicles, trailers & other vehicles	9	650	1 104.1
31	Furniture	32	878	1 378.8
32	Other manufacturing	46	2 749	2 060.9
33	Repairs and installation of machinery and equipment	6	148	385.1
35	Electricity, gas, steam and air conditioning	7	2 254	14 814.8
36-39	Water supply; sewerage, waste management and remediation activities	11	1 721	1 653.5
05-39	All industrial activities	711	79 200	149 883.0

¹ According to 2nd Revision of the National Standard Industrial Classification of all economic activities. The NSIC coding system used by Statistics Mauritius is adapted from the United Nations International Standard of Industrial Classification of economic activities (ISIC)

² Only large establishments, i.e. at least 10 employees

³ Gross output at basic prices

Finally, it is also important to consider the regional distribution of industries (Table 1.8) as it is an important factor in the trading and use of chemicals across the country.

Table 1.8: Regional distribution of industrial production for export-oriented enterprises				
District	Major products	Number of industrial facilities	Number of employees	Industrial zones
Black River	Textile	19	3 622	La Tour Koenig Petite Rivière
Flacq	Textile	22	3 170	Bel Air
Grand Port	Textile	13	767	
Moka	Textile	46	4 944	St Pierre Verdun
Pamplemousses	Textiles	51	4 012	Riche Terre Solitude
Plaines Wilhems	Textile	117	20 567	Valentina - Phoenix Floreal Mare-Gravier Vacoas
Port-Louis	Paints, Textile	58	7 980	Baie du Tombeau Pailles Plaine Lauzun Coromandel Bell Village
Rivière du Rempart		41	7 800	Goodlands La Clemence Ile d'Ambre
Savanne	Textile	14	2 788	Surinam
Total		381	55 650	

Chapter 2

CHEMICAL PRODUCTION, TRADE, TRANSPORT, USE AND DISPOSAL

Mauritius possesses no natural resources that could be practically exploitable for producing basic chemicals for its own use. It therefore relies on importations of chemicals which have a considerable value on the national budget as the chemicals are key raw-materials or requirements in various sectors. As discussed in Chapter 1, the driving force of the economy has gradually shifted from agriculture to services. However, the industrial sector also requires large amounts of chemicals.

2.1 CHEMICAL PRODUCTION, IMPORTS AND EXPORTS

2.1.1 Chemical Production

There is hardly any primary production of chemicals done in the Republic of Mauritius. The country does not have the appropriate resources like minerals, natural gas or petroleum which would have allowed it to produce basic chemicals like mineral acids or hydrocarbons for local consumption and export. Consequently, mining and extraction activities are inexistent. However, with the presence of the sugar cane industry, the country has successfully exploited its by-products for the manufacture of alcoholic spirits intended for the beverage industry, alcohols as cleaning medium and of vinegar which is a diluted form of acetic acid.

The sustainability of the sugar cane industry during decades required the use of chemical fertilisers to maximize yields of sugar which is an export-oriented commodity. For this reason, Ammonium nitrate-based fertilisers were being manufactured locally at a plant situated within the port area. It ceased production in 2004, but then shifted to blending of chemical ingredients to manufacture Nitrogen Phosphorus Potassium (NPK) fertilisers. It is also noted that molasses which is a liquid extract obtained during sugar cane milling operations is also used as fertilisers after mixing with other substances.

There was also some rudimentary production of ethanol produced from bagasse which is a fibrous material obtained as a by-product of the sugar production. By means of fermentation, it was harnessed industrially into ethanol at a plant which was located in the southern part of the island. The ethanol was meant for exportation as a fuel after mixing with gasoline in a 1:9 ratio. Unfortunately, the production plant had to stop its operation in 2005 due to a prohibition notice issued for the non-respect of the national environmental legislation.

The non-agricultural sectors which took off since the 1970s consist of manufacturing companies for the industrial production of consumer goods like processed foods, soaps, detergents, cosmetics, paints, adhesives, etc. Moreover, with a significant increase in the number of SMEs and micro-enterprises, over past two decades, there are more companies involved in the small-scale manufacture of consumer chemicals especially cleaning products for local market. Unfortunately, it has been observed that many products manufactured by these small companies do not have proper labelling or do not display any hazard information to the attention of users. Secondary production of chemicals takes place in Mauritius, wherein the basic chemicals required as raw-materials are imported. The production of industrial gases such as Carbon dioxide or Ozone is carried out in view of use in the manufacture of beverages. In the construction industry Acetylene gas is produced from imported Calcium Carbide. Another example is the Mauritius Meteorological Services which produces Hydrogen gas at a low pressure from air through the process of electrolysis at its main station for the daily ascent of meteorological balloons i.e. for weather forecasting.

2.1.2 Chemical Imports

The major imports are via maritime routes while smaller consignments are often received by air (mostly laboratory chemicals). The principal sources of the imported chemicals are China, South Africa and India (mainly for petroleum products). There are a few local companies are exclusively involved in the supply, marketing and distribution of imported chemicals to other institutions, enterprises, etc. All imports into and exports from Mauritius are subject to declarations to the Customs Department (CD) operating under the aegis of the Mauritius Revenue Authority, a specialised agency falling under the purview of the Ministry of Finance and Economic Development. The CD operates under the Customs Act. Any person or company trading in chemicals must be duly licensed and registered with the Dangerous Chemicals Control Board (DCCB). The DCCB and the Dangerous Chemicals Advisory Council (DCAC) are established under the Dangerous Chemicals Control Act (DCCA), a law specifically introduced for the management of chemicals in Mauritius in 2004. [6] The DCCB presently operates under the Occupational Health Unit of the Ministry of Health & Quality of Life.

The CD and the DCCB work in close collaboration before clearance of any chemical is granted and regulate the trade of dangerous chemicals in Mauritius. In addition to them, there are other several stakeholders responsible to ensure that dangerous chemicals (as described in the DCCA) do not pose any risks to the environment or health during storage within port areas or in external warehouses, road transportation and distribution. Eventually, traders, local distributors or other end-users of chemicals also have their respective roles to play within the stages of the life-cycle of the chemicals.

2.1.3 Classification of chemicals

All imported chemicals are classified by the CD using the same coding structure established by the World Customs Organisation (WCO). The classification of any type of tradable goods intended for transboundary movement is given in the Customs Tariff Schedule (Integrated Tariff) applied by the CD, which uses the Harmonized System (HS) codes for identification of all imported goods. These HS codes are universally accepted and are derived from the Sections and Chapters of the Customs Tariff Schedule. Each HS code is a number bearing a maximum of 8 digits. With regard to chemicals and chemical products, these are found in Section V (Chapters 25 - 27), Section VI (Chapters 28 – 38), Section VII (Chapters 39) as summarised in the Table 2.1.

Notably, the Customs Department, the Dangerous Chemicals Control Board and Statistics Mauritius are the few institutions which are familiar with identification and classification of chemicals as per their HS Codes.

Table 2.1: Chapters relevant to chemicals in the Customs Tariff Schedule			
Section	Chapter	Description	HS Codes headings
Mineral Products	25	Salt; sulphur; earths and stone; plastering materials, lime and cement	25.01 to 25.30
	26	Ores, slag and ash	26.01 to 26.21
	27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	27.01 to 27.15
Products of the chemical or allied industries	28	Inorganic chemicals; Organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	28.01 to 28.53
	29	Organic Chemicals	29.01 to 29.42
	30	Pharmaceutical products	30.01 to 30.06
	31	Fertilisers	31.01 to 31.05
	32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	32.01 to 32.15

Products of the chemical or allied industries	33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	33.01 to 33.05
	34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster	34.01 to 34.07
	35	Albuminoidal substances; modified starches; glues; enzymes	35.01 to 35.07
	36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	36.01 to 36.06
	37	Photographic or cinematographic goods	37.01 to 37.07
	38	Miscellaneous chemical products	38.01 to 38.26
Plastics and articles thereof; rubber and articles thereof	39	Plastics (Primary Forms)	39.01 to 39.14
	40	Rubber and articles thereof	40

2.1.4 Importers' profile

As of 2013, there are about 250 license holders for the trade of chemicals as per the DCCB, this includes large industrial groups as well as small private companies. The following categories of importers are applicable to Mauritius:

- Companies importing chemicals for their own needs only.
- Companies importing chemicals for their needs as well as needs of sister companies.
- Companies importing chemicals in bulk and involved in their distribution and sales in small packages.
- Companies importing, distributing and selling chemicals in their original packages to other companies, governmental or educational organisations.
- Companies importing chemicals and selling them on retail basis (for e.g. agrochemicals or automobile paints, solvents, etc.).
- State Trading Corporation (STC), a public company importing petroleum products for distribution.

Within the scope of this project, a national survey was conducted on the trade and management of chemicals in Mauritius, whereby some selected traders were invited to fill in a questionnaire (see Annex 2). The response rate was about 50 % and common findings of the survey are as follows:

- Traders of chemicals usually do not conduct any major extended responsibility programmes, except for agrochemicals, wherein advice is given to planters on agrochemicals which they procure from importers.
- The trade of chemicals is subject to different regulations as imposed by UN Conventions or other international ones like GHS or REACH for products emanating from the European Union.
- All chemical trading companies face waste disposal problems especially the end-users.
- Very few generic chemicals are usually imported.

Table 2.2 shows some of the data gathered through the National Survey on Trade of Chemicals.

Table 2.2: Main findings of survey on chemicals											
Company activities	Chemicals traded for		Trade details (annual)				Chemical safety aspects		Company logistics & resources available		
	Uses (own & multiple)	Sales & marketing	Chemical (Name /Type)	Quantity (tons)	Packaging	Approx. value (MUR)	Training & awareness of workers	Policy to manage chemicals	Transport & distribution	Facilities	Others
Manufacture of edible oil	x		Citric acid	0.5	20 bags	45 000	Conducted in-house by SHO as and when needed	Emergency response plan for accidents, spills, fires, etc.	Contractual vehicles only	Dedicated areas for storage and processing	Testing laboratory - Waste-water treatment facility.
	x		Sodium hydroxide	120	4 800 bags	2 753 000					
	x		Phosphoric acid	41	112 drums	2 108 000					
Service provider (laboratory testing)	x		Laboratory chemicals	Und.	Und.	Und.	Conducted in-house by SHO and other supervisory staff as and when needed	<ul style="list-style-type: none"> • Safe chemical storage. • Health & Safety Policy 	Not applicable	Dedicated areas for storage, processing of chemicals and wastes	<ul style="list-style-type: none"> • Scientific testing equipment. • Workers' medical insurance cover & yearly health check
Production of consumer goods & service provider	x	x	Consumer chemicals (intended for local uses and exports)	2 700	2 850 000 units	93 Millions	Conducted in-house and by outsourced consultants as and when needed	Emergency response plan for accidents, spills, fires, etc.	Company & contractual vehicles both used	Dedicated areas for storage, processing of chemicals and wastes	<ul style="list-style-type: none"> • Testing laboratory • Waste-water treatment facility.
Manufacture of textile products	x		Industrial chemicals e.g. Azo dyes	2 200	Und.	Und.	Conducted in-house as and when needed	Company environmental policy	Contractual vehicles only used	Dedicated areas for storage, processing of chemicals	• Testing laboratory
			Consumer chemicals	0.2	Und.	Und.					
Manufacture of textile products	x		Und.	Und.	Und.	Und.					
Production of fertilisers, consumer goods & service provider (laboratory testing)	x	x	Und.	Und.	Und.	Und.	Conducted in-house as and when needed	<ul style="list-style-type: none"> • Health & Safety Environment Quality (HSEQ) policy • Emergency response plan of the MPA 	Company & contractual vehicles both used	Dedicated areas for storage, processing of chemicals and wastes	Testing laboratory Basic wastewater treatment at one facility Workers' medical insurance cover

Key: X = Applicable, Und. = Undisclosed

2.1.5 Categories of imported chemicals

At present, the CD uses only HS codes to identify and further classify chemicals imported in Mauritius. However within the scope of this NCP, the chemicals currently imported can be grouped together and considered in the form of redefined categories as listed below:

(a) Pesticides (Agricultural)

In spite of the gradual reduction of agricultural activities, pesticides are still imported in large amounts. Due to its tropical climate, Mauritius is often vulnerable to attacks from new pests introduced by external sources. Pesticides can be further classified as insecticides, rodenticides, fungicides, herbicides, acaricides, etc. i.e. based on the type of pests targeted. Figure 2.1 shows annual import figures for 2007 to 2011 for three main types of agricultural pesticides.

Figure 2.1: Annual Imports of Agricultural Pesticides (tons)



(b) Pesticides (Public health)

Pesticides are also used to manage public health since Mauritius is a tropical country and may be subject to outbreaks of communicable diseases like malaria if proper vector control is not achieved. Examples of pesticides used in this sector are the pyrethroids.

(c) Pesticides (Consumer use)

Another group of pesticides is related with consumer uses and are commonly applied in offices, food industries, hotels, retail food outlets, households and other private places to keep insects and other pests at bay.

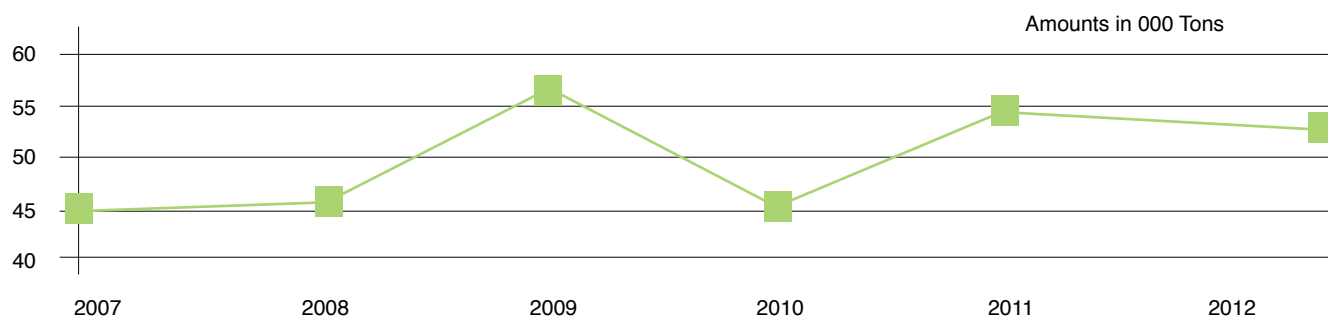
Some examples of these pesticides are:

- Insect repelling sprays
- Moth-balls
- Mosquito coils and mats
- Insect killing sticks (chalks)

(d) Fertilisers

Fertilisers represent an important group of agrochemicals imported into Mauritius. As fertilisers are no more produced, they must be imported in large quantities for various types of crops including sugar cane. Figures generated by Statistics Mauritius indicate that an estimated amount of 50 000 tons of fertilisers were imported for the period 2007 to 2012 as shown in Figure 2.2.

Figure 2.2: Annual Imports of Fertilizers



Source: Digest of Agricultural Statistics 2011, Statistics Mauritius

(e) Petroleum products

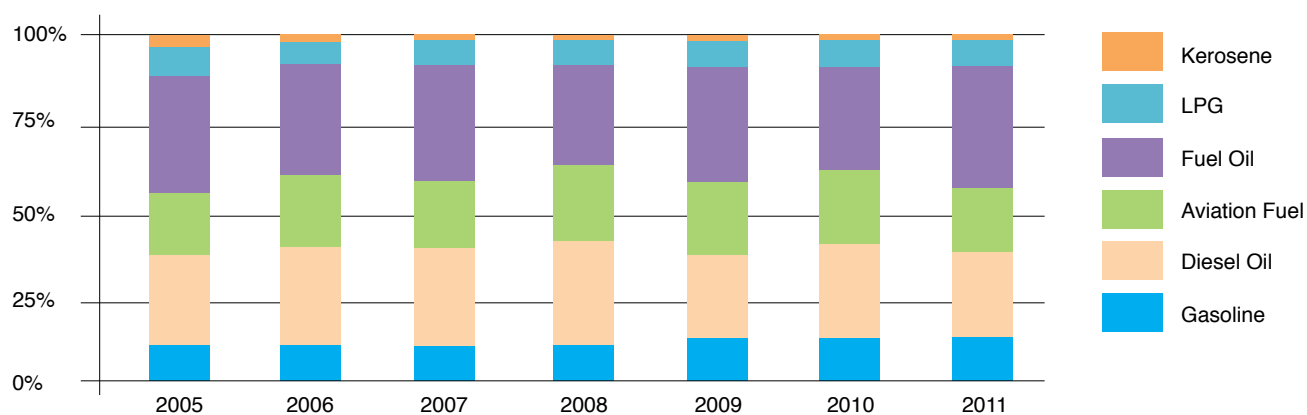
Petroleum products account for the largest amounts (about 1.2 million tons annually) of chemical imports as Mauritius relies principally on fossil fuels for energy generating purposes. Petroleum products are imported by the State Trading Corporation. The storage, distribution and sales to consumers are done by private companies.

The specific petroleum products imported are:

- Fuel oil: There are three main types imported, namely Fuel Oil 180 cSt Catalytically Cracked, Fuel Oil 180 cSt Straight Run and Fuel Oil 380 cSt Straight Run. The first type is intended for sale to the local distributors and for bunkering of vessels. The other ones are directly sold to the Central Electricity Board (CEB) for power generation.
- Jet A-1: It is sold as aviation fuel mostly, while a small amount is sold as kerosene.
- Gas oil: It is imported in two grades based on Sulphur (S) content, namely 2 500 ppm S for bunkering of marine vessels and 50 ppm S for road transport.
- Liquefied Petroleum Gas (LPG): Its intended use is mostly as a cooking gas for households and commercial entities. It is available in cylinders in the retail market. A small number of road transport vehicles also run on LPG.
- MOGAS: Destined for local consumption only.

Figure 2.3 shows the relative percentages of imported of petroleum products from 2005 to 2011 according to the Energy Observatory Report (EOR) 2011 published by the Energy Efficiency Management Office under the Ministry of Energy and Public Utilities. [8]

Figure 2.3: Importation of petroleum products in Mauritius



Source: Energy Observatory Report (EOR) 2011

(f) Industrial chemicals

The manufacturing sector requires chemicals as raw materials. There is a direct relationship between the expansion of the manufacturing sector and amounts of industrial chemicals needed.

Some examples of chemicals used by this sector are as follows:

- Organic solvents like toluene, xylenes.
- Dyestuffs and textile auxiliaries.
- Polymerised substances like glass fibres.
- Acids, alkalis, buffers etc.
- Inorganic compounds like soda ash or lime, cyanide.
- Metals & metallic compounds.

Table 2.3 shows the amounts of industrial chemicals imported by selected industries such as the paint and allied industries from 2010 to 2013.

Table 2.3: Imported amounts of EDCs (kg) for selected industries for years 2010 to 2013				
Chemical	Amounts in 2010 (kg)	Amounts in 2011 (kg)	Amounts in 2012 (kg)	Amounts in 2013 (kg)
Cadmium	0	0	0	133
Chromium	1 290	1 885	2 576	610
Dibutyl Phthalate	7 120	0	560	0
Lead Chromate	4 500	4 400	0	0
Other Lead compounds	0	5 541	0	500
Zinc	4 300	3 100	7 420	1 400
Zinc Chromate	0	200	1 660	800
Total	17 210	15 166	12 216	3 443

According to the DCCA, all chemicals mentioned above are classified as Extremely Dangerous Chemicals (EDCs). However, from 2010 to 2013 the total amount has decreased from 17.2 tons to only 3.4 tons.

(g) Consumer chemicals

Consumer chemicals are those which are not used in public health, agriculture, manufacturing, and other industrial activities. Based on the market demands, such chemicals are commercialised on retail basis and hence made easily accessible to the public at large. Some examples of chemicals in this category are:

- Chemicals directly used for cleaning, refurbishment, etc.
- Consumer goods containing an active chemical ingredient used for cleaning, refurbishment, etc.
- Organic solvents for paint and grease removal.
- Waxes, varnishes, etc.
- Bleaching agents.

(h) Miscellaneous chemicals

Some of the imported chemicals cannot be placed in a specific category due to their multiple uses. For instance, Sodium hydroxide is used as an Industrial chemical in various processes, as a household chemical for cleaning purposes as well as in laboratories for analytical and research purposes. Laboratory chemicals as well as those used in medical facilities are included as they are imported in smaller amounts. Some examples are given below:

- Inorganic and Organic acids
- Alkalis and bases
- Common compounds like Sodium carbonate
- Alcohols for cleaning or sterilisation.

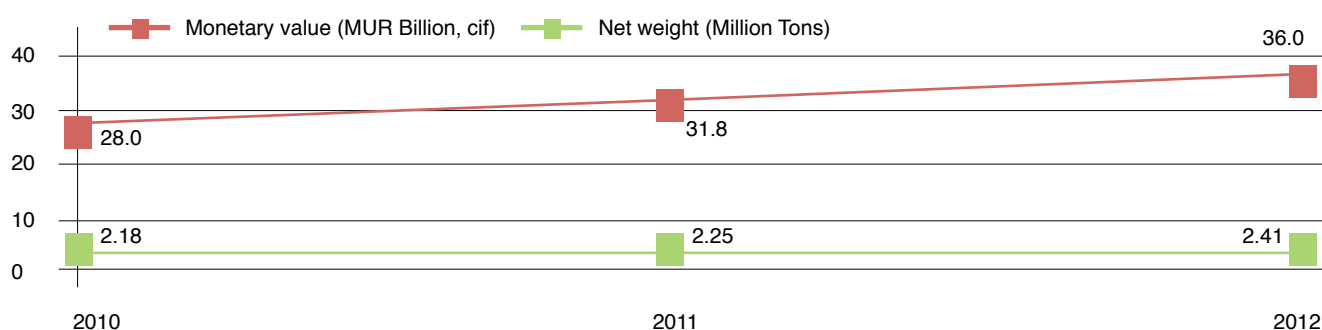
Table 2.4 provides a quantitative description of the amounts and value of the chemical imports into Mauritius in 2012.

Table 2.4: Imports of Chemicals in 2012 and 2013					
No.	Chemical category	2012		2013 ¹ (January to September)	
		Net weight (tons)	Import Value (MUR Millions)	Net weight (tons)	Import Value (MUR Millions)
1	Pesticides	2 085.8	363.3	1 571.4	276.0
2	Fertilizers	52 739.0	834.9	23 160.8	314.7
3	Petroleum products	1 246 768.0	29 270.0	993 955.0	23 019.8
4	All other types(industrial, consumer & miscellaneous chemicals)	178 203.1	12 493.2	113 713.5	9 300.0
5	Total	1 479 795.9	42 961.4	1 132 400.7	32 910.5

Source: Statistics Mauritius, ¹Provisional

An analysis of figures from 2010 to 2012 of the amounts of chemical imports, shows that both the net weights and their corresponding monetary values have increased. This can be seen in Figure 2.4 which applies for items listed under HS Code 25 to HS Code 40 and some selected ones from HS Code 47 to HS Code 81.

Figure 2.4: Quantity and value of chemicals imported, from 2010 - 2012



It may be reasonably expected that the trend is likely to continue for future years in accordance with the development of the country.

2.1.6 Chemical exports

Imported chemicals are used in industrial production of consumer goods such as paints, detergents, cement, which can then be exported. Moreover, in some cases, chemical substances are also exported after re-packaging.

The amounts of chemical exports as well as their monetary value have been found to increase from 2011 to 2012. According to the Mauritius Chamber of Commerce and Industry (MCCI), in 2011, Mauritius exported 553.7 tons of chemical substances classified under HS Code 38 (Miscellaneous chemical products) for a total value of MUR 55.9 Million (f.o.b). In 2012, for goods under the same HS Code, the amounts exported reached 1 070.6 ton i.e. almost twice the previous year while the monetary value was MUR 64.8 Million (f.o.b).

2.2 TRANSPORT AND DISTRIBUTION OF CHEMICALS

Throughout their life cycle, chemicals are continuously transported and distributed over long and short distances depending on the circumstances and requirements. For instance, chemicals may be moved from ships into warehouses for storage on terrestrial surfaces of the port area, they may be transported from a supplier to an end-user i.e. during sales and distribution or they may be carried as waste to disposal facilities at the end of their life-cycle. Dangerous chemicals must be transported in properly sealed and labelled containers as prescribed by the UN Recommendations on Transport of Dangerous Goods Model Regulations or the International Maritime Convention on Dangerous Goods (IMDG).

In the Republic of Mauritius, the commonest mode of transport for the distribution of chemicals is the road network while a fraction of the original imports are shipped to Rodrigues and the outer islands. The various stakeholders involved in transportation of chemicals are expected to ensure proper care so that the transportation does not entail in any accidents or undesired events affecting health or environment.

2.2.1 Chemicals within the port areas

The capital of Mauritius, Port Louis is one of the largest ports in the Indian Ocean region. The port premises have been continually improved and enlarged to meet with increasing demands for movement of goods in and out of Mauritius. Most of the maritime traffic reach the country from three main ports located in Durban (South Africa), Singapore and Dubai (UAE). The Mauritius Port Authority (MPA), a para-statal body, operating under the Ports Act 1988 has the overall responsibility of the port premises. Further details on the Act and the MPA are given in Chapters 4 and 5.

As the largest proportion of chemicals reaches the country by ships the port premises must be secure and safe to receive chemicals substances classified as hazardous goods by the port stakeholders. Among the available facilities and logistics in the port area, the ones more relevant for the movement and temporary storage of hazardous goods are shown Table 2.5.

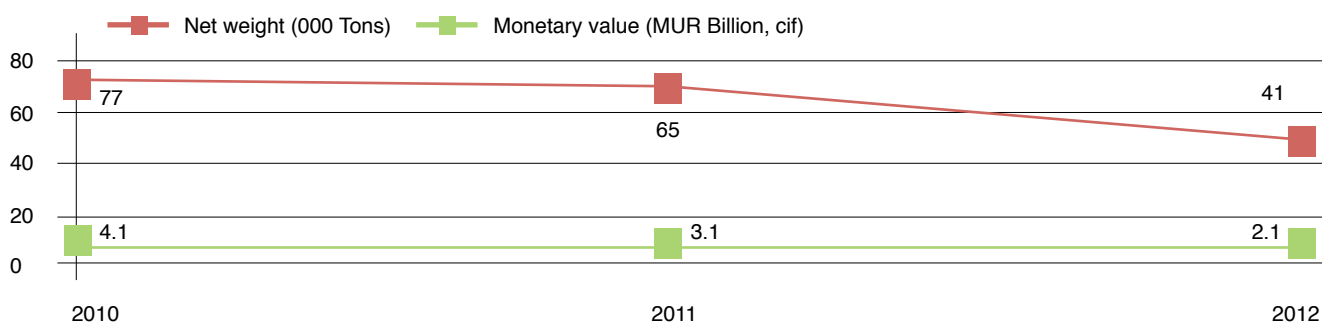
Table 2.5: Description of port facilities for hazardous and other chemicals			
Location	Facilities	Capacities	Types of goods handled
Terminal I	Quays A, D & E	Total length 515 m	Oil, General cargo and goods for inter-island trade
Terminal II (Multipurpose)	Quays No.1, No.2, No.3 & No.4	Total length 673 m	Fertilisers, Caustic Soda, LPG, Bitumen, Coal, General cargo, containers
Terminal III (Container Park)	Quays No.1 & No.2	Total length 560 m	Containers
Oil Jetty	Eight pipelines	Annual throughput of four Million tons	Petroleum products

Source: www.mauport.com

The Port Emergency Services is a specialized unit consisting of trained personnel to respond to any accidental events such as oil spills within the port areas both on land and at seas. In addition, the port also has its own firefighting and police sections to respond to any emergencies. These dedicated services are highly important as the port areas contain oil pipes and bunkers, the Fort George power plant, a coal depot, cement, flour, rice and grains silos, a fertiliser manufacturing plant amongst others. Moreover, the port area is within a few kilometres from the city centre and inhabited areas. The port is also in close proximity with the Terre Rouge Estuary and Bird Sanctuary which is a wetland reserve for migratory birds listed as a RAMSAR site.

The port areas also provide trade facilities for goods as stipulated under the Freeport Act which also applies to chemicals and chemical products. Figure 2.5 shows a decrease from 2010 to 2012 as regards the net weight of chemicals in the Freeport zone. This may be due to the fact that most traders are distributors or end-users of these goods, and hence are more likely to clear the them from the port areas instead of storage within the Freeport zones.

Figure 2.5: Net weight and Monetary value of Chemicals in Freeport zones, 2010 - 2012



2.2.2 Logistics available within the airport premises

The SSR International Airport is the only airport in Mauritius and receives passenger, private and cargo flights and may at times receive military planes for refuelling. A new airport terminal has been put into operation in 2013. These new facilities have duly increased the capacity to cater for more airplanes, passenger and goods movements. As the airport houses bulk depots of Aviation Fuel (Jet A-1) some of its premises are highly restricted.

2.2.3 Road transportation of chemicals

Inland transportation is only done through road networks within Mauritius, since as of 2013 there is no railway system or internal maritime transportation. As per road transport legislation, all goods' carriers must be duly registered with the National Transport Authority (NTA) a parastatal body which issues and renews licences for such transportations. However, no special licences are presently applicable for vehicles to specifically carry chemicals except for flammable liquids depending on the Flammability Class and the volume transported. Moreover, waste carriers which may be transporting hazardous or chemical wastes also require a licence from the Ministry of Local Government & Outer Islands prior to the NTA licence.

Petroleum products which represent the largest category of imported chemicals volume-wise are transported by the four local oil distributors as they have their own fleet of carriers or by private contractors towards the various refill stations, industrial facilities or the airport. The construction and use of these vehicles must be in accordance to the Road Traffic Act (RTA). As of June 2013, a total of 432 331 vehicles were registered with the NTA which includes the carriers of chemicals. Depending on the consignments, different types of vehicles are used for transporting chemicals as per Table 2.6.

Vehicle type	Examples of chemicals transported
Lorries and Heavy trucks	Petroleum products (liquid fuels & pressurised gases in cylinders) Industrial gases in cylinders Hazardous wastes Liquid fertilisers, coal
Vans	Industrial chemicals Agrochemicals
Double cab pick-ups	Industrial chemicals Pesticides
Cars	Laboratory chemicals Consumer chemicals
Autocycles	Pesticides (Domestic or office applications)

Since Port Louis is the main entry point of goods into Mauritius, these must be directed to different regions across the island. Consequently, vehicles carrying chemicals have to use busy motorways and other public roads which go through inhabited regions. Table 2.7 gives an overview of selected locations to which chemicals are generally transported from Port Louis.

User category	Location	¹ Distance from Port Louis (km)	Examples of chemicals transported
Manufacturing industries	Pailles	3.7	Textile chemicals, Organic solvents, Dyes & Paints
	Plaine Lauzun	2.9	Textile chemicals, Organic solvents, Dyes & Paints
	Coromandel	5.6	Textile chemicals, Organic solvents, Dyes & Paints
	Valentina - Phoenix	16.2	Textile chemicals, Organic solvents
	Phoenix	17.5	Medical gases
	GrandRiver/North West	3.3	Industrial gases
	Petite Rivière	7.5	Organic solvents
	Riche Terre	6.4	Agrochemicals, Water treatment chemicals
	Goodlands	27.7	Organic solvents, Textile chemicals
	La Tour Koenig	4.6	Textile chemicals, Organic solvents, Dyes & Paints

¹As per the shortest routes provided by Google Maps

Electric power producers	CEB St Louis	2.7	Heavy fuel oil
	CEB Fort Victoria	2.7	Heavy fuel oil
	CTDS St Aubin	48.6	Heavy fuel oil
	CTBV Belle Vue		Heavy fuel oil
SSR International Airport	Plaisance	47	Aviation fuel
CWA	La Nicolière storage site	22	Chlorine

In general, transporters of heavy duty vehicles have to respect stricter speed limitations, not applicable for lighter vehicles e.g. vans carrying corrosive liquids or any other hazardous chemicals. As a precautionary measure, during normal working days, driving of heavy duty vehicles is not allowed on the motorways during peak hours in the morning (0700 to 0915).

Fortunately, there have not been major road accidents wherein chemicals spilled out from their containers onto roads, other infrastructure or people. Recorded road accidents related to chemicals were mostly due to spillage of petroleum products as a result of mechanical failure during bad weather. Since Mauritius is still undergoing infrastructural development, roads are gradually getting more congested. As of 2013, the number of vehicles per km of road has reached 190 and simultaneously the total road length (2 112 km in 2011) is also increasing each year. Therefore regulatory authorities need to be vigilant in respect of the transport of chemicals as accidents remain highly unpredictable events.

2.3 USES OF CHEMICALS

2.3.1 Uses of chemicals by categories

In practice, at the time of imports, the traders of chemicals and chemical products must provide information on the intended uses. However, there is no database which covers all current users of chemicals in Mauritius. Information can be gathered through governmental institutions i.e. the CD, DCCB and Statistics Mauritius and also from private companies trading and distributing in chemicals. A general description of chemical users is given in Table 2.8.

Category	Users	Applications
Agricultural chemicals	Sugar estates	Cultivation of sugar cane for production of sugar and other items.
	Agricultural enterprises (Both large and SMEs)	Cultivation of vegetable and fruit crops, livestock meat, etc. for local market and exports. Production of fruit juice.
	Ministry of Agro-Industry and Food Security including its para-statal bodies	Experimentation and trials on locally grown crops. Pest control services.
	Hotels	Cultivation of vegetable and fruit crops for own use.
	Small planters and co-operative societies	Cultivation of vegetable and fruit crops for sale.
	Individuals	Cultivation of vegetable and fruit crops for sale.
Pesticides (for public health)	Ministry of Health & QL	Vector Control and control of communicable diseases.
	District and Municipal Councils	Vector Control and control of communicable diseases.
Pesticides (Consumer use)	Service providers	Pest control activities inside offices, buildings, shops, etc.
	Individuals	Pest control activities at home.
Petroleum products	CEB & IPPs	Production of electricity.
	Manufacturing industries	Production of power in boiler houses and other units.
	Public sector, private sector, individuals, etc.	Production of power for transportation (air, sea and land).
Industrial chemicals	Manufacturing industries	Local production of various types of goods such as foods and beverages, edible oils, textiles, apparels, jewellerys, plastics, adhesives, cosmetics, plastic pipes, water tanks, polymeric materials, foam, metal structures, industrial gases, soaps, detergents, paints, building materials etc.
	Building maintenance companies	Provision of services such as water proofing, painting, insulation, refrigeration, air-conditioning, etc.

Industrial chemicals	Gardening companies	Maintenance of green lawns, golf courses in hotels, etc.
	Water treatment companies	Provision of services such as swimming pool cleaning, water and wastewater treatment
	Vehicle maintenance companies	Automobile waxing and painting services, Lubricating services (Change of motor oils & fluids)
	Textile washing companies	Dry Cleaning and laundry services
	Printing companies and press	Production of newspapers, periodicals, and other printing works
	Para-statal bodies in the water sector.	Large-scale water treatment
Consumer chemicals	Service providers	Sanitary and other cleaning works
	Individuals	Household works like cleaning, waxing, paint removal, gardening, painting, etc.
Miscellaneous Chemicals	Public and private sector laboratories	Analytical and research purposes
	Educational at secondary and tertiary levels	Educational and research purposes
	Private centres and tutors	Running of practical Chemistry classes
	Artists and museum personnel	Conservation of art works or specimens
	SMF	Military purposes or demolition works
	Medical laboratories	Testing of biological samples and sterilisation

This section provides further information on the chemicals listed in Table 2.8.

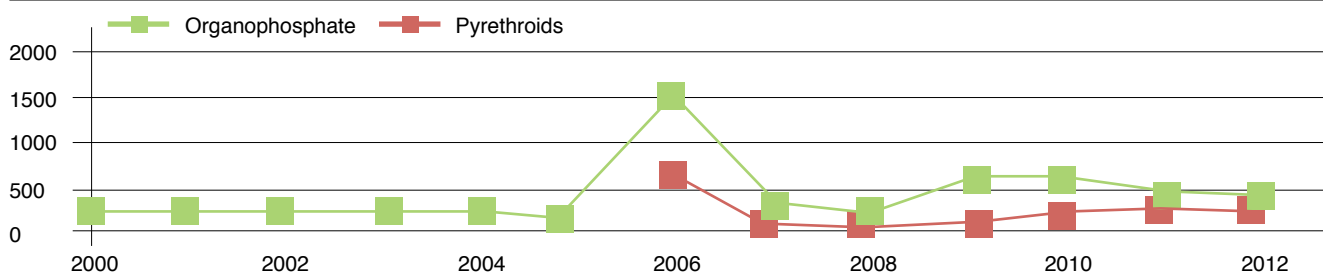
(a) Agrochemicals

Agrochemicals are mainly used in the production of crops by various types of users. In addition, they are also used by public institutions for research and experimentation purposes so that findings obtained can be eventually shared with the whole planter community for their benefit. Comparatively, the amounts used by this category of users are smaller and easier to compile for a defined period. For instance the amounts used at one Crop Research Station Agricultural & Research Extension Unit (AREU) from September 2012 to September 2013 were 124.4 litres and 69.95 kg of Herbicides: 31.5 litres and 10.8 kg of Insecticides and 27 litres and 50.5 kg of Fungicides.

(b) Non-agricultural pesticides

Pesticides are also used in the area of public health namely for the control of vector-borne diseases. The Communicable Diseases Control Unit (CDCU) which functions under the Ministry of Health & QL ensures the adequacy of stocks of these pesticides and all related equipment used for spraying, larviciding and fogging activities in public places. It may be noted that Malaria caused severe problems in the pre-independence era as it had threatened human populations. Accordingly, the WHO donated pesticides to the Ministry responsible for Health for any new outbreaks and containment during emergencies. The insecticide DDT which is a POP featured among these donated pesticides. As alternatives to DDT, the CDCU started using three pyrethroid pesticides towards the middle of the 2001 – 2010 decade. It must be noted that after 2010, DDT was not used again for the above purpose, although five tons of the insecticide are still being kept. On the other hand, organosphate pesticides were already in use since 2000. Figure 2.6 shows the use of these two types whereby the amounts were in litres as the pesticides were in liquid formulations. The peak amount during the year 2006 is accounted for an outbreak of the tropical disease Chikungunya.

Figure 2.6: Use of organophosphates and pyrethroid pesticides (kg/year) by the CDCU



Source: CDCU, MoHQL

(c) Petroleum products

Petroleum products are used to produce energy by the Central Electricity Board, and in industries as well as to a limited extent for domestic purposes. However, it is also expected that a few types of substances which are derived from petroleum are in fact not accounted in this category, but are considered as industrial chemicals for example solid wax which is used for candle-making and in the manufacture of ornamental objects.

As regards the quality of fuels used in Mauritius, only unleaded gasoline is being used since the early 1990s. Moreover, the levels of Sulphur (S) in diesel oil have also decreased according to the State Trading Corporation. 500 ppm S diesel oil was used as from October 2010 until March 2011 when 50 ppm S diesel oil was introduced. From actual laboratory analyses conducted by an accredited laboratory, the S content currently varies from 30 to 40 ppm. Thus, gaseous emissions contain no Lead and less oxides of Sulphur due to combustion of petroleum products such initiatives are aligned within the concept of Sound Management of Chemicals.

(d) Industrial chemicals

Industrial chemicals are intended for a wide range of processes like blending, colouring, distillation, extraction, 'pickling' or preservation during the manufacture of any type of consumer goods. As the manufacturing sector of Mauritius has diversified over the recent years, the consumption of industrial chemicals is expected to increase.

Industrial chemicals are also used in cleaning, maintenance or refurbishment works, for instance grease-removers, waxes, solvents, or laundry and cleaning chemicals like sodium hypochlorite. Owing to the major expansion in the services sector, there are many small and large companies which take up contractual works for these purposes such as water treatment or maintenance of swimming pools, large fish tanks, etc. In this respect, the public institutions involved in water treatment also use industrial chemicals, for instance the CWA uses 30 tons of liquid chlorine per month for sterilisation of drinking water.

Certain industrial chemicals are subject to strict regulatory controls for instance Chlorofluorocarbons (CFCs) a family of inert chemical substances but having a high stratospheric ozone depleting potential. Since 1999, Mauritius banned the imports of electrical equipment containing which use CFCs as refrigerants and of aerosols. As of January 2013, a ban on Hydro Chlorofluorocarbons (HCFCs) also used as refrigerants has been proposed by the regulatory authorities. A shift to other technologies based on Ammonia and Carbon dioxide gases as refrigerants is being encouraged.

According to the Ministry of Industry, Commerce and Consumer Protection (MoICCP), the manufacturing sector, comprised of 33 operating enterprises, out of which 25 were Domestic Oriented Enterprises (DOEs) and eight Export Oriented Enterprises (EOEs) as at March 2013. This chemical sub-sector accounted for an aggregated employment of 2306 persons for the same period as per the MoICCP. These local manufacturing enterprises mainly produced consumer chemicals and chemical products like paints, soaps & detergents, etc.

2.4 CHEMICAL WASTES

2.4.1 Characterisation of wastes

Chemical wastes are chemicals at the end of their life cycle, however, the term 'Chemical wastes' can have different interpretations. It is also very common to consider obsolete or expired end-products or consumer goods containing harmful substances as chemical wastes, for e.g. old paints or expired creams. Chemical wastes include the following:

- Chemical substances whether in use or in stores which have already crossed their expiry dates on their respective original containers.
- Chemical substances found in stocks which have become obsolete for e.g. pesticides which have never been used

- or a liquid substance found in a bottle which has never been opened since procurement.
- Chemical substances whether obsolete or usable getting released as a result of a spillage, leak or other types of accident while no further uses exist for them.
- Expired or obsolete consumer products which contain hazardous chemicals, for e.g. old batteries or unused pesticides.
- Effluents or solid wastes generated from a factory or an industrial unit as a result of processes containing specific toxic substances for e.g. Chromium (VI) compounds or spent dyes.
- Effluents or solid wastes generated from a laboratory whether for research, academic, analytical or commercial purposes which contain toxic substances for e.g. Mercury compounds or cyanides.
- Obsolete pharmaceutical substances, medicines, which have expired or drugs of abuse which have been intercepted by Customs Officers or seized drugs during police investigations.
- Certain types of medical wastes generated by medical facilities e.g. unused or obsolete pharmaceuticals, sterilising and dressing solutions and wastes generated by medical laboratory testing.

Chemical wastes must be properly disposed depending on their characteristics and amounts generated. The disposal means include chemical treatment (e.g. via reactions like neutralisation or oxidation), solvent recovery, recycling, incineration, etc. using modern facilities. For some type of wastes, storage is currently the only practically available solution in Mauritius. On the other hand, for small amounts of chemical wastes generated, alternative solutions can be possible provided the right technologies and knowhow are available for treating them, while for medical wastes incineration is often applied.

2.4.2 Impacts of chemical wastes

Chemical wastes, if not properly managed, can have serious implications to both the environment and health in addition to economic or social consequences arising from these implications. The impacts of chemical wastes on the environment are:

- Pollution of surface and underground waters.
- Drinking water contamination.
- Air pollution.
- Reduced soil fertility.
- Land pollution.
- Threats to biodiversity.

Some of the impacts on human health further to exposure or contamination by chemical wastes are as follows:

- Skin burns resulting from any wastes of corrosive nature.
- Irritations of the skin, eyes, throat, etc.
- Nausea and vomiting arising due to exposure to highly malodourous chemical wastes like sulphides.
- Respiratory diseases especially resulting from combustion of chemical wastes.
- Reduced efficiency of immune system making the body prone to diseases.
- Mutagenic effects in case of severe contamination from toxic wastes.
- Other ill-health conditions such as increased Blood Lead Levels.

2.4.3 Chemical wastes in Mauritius

The fate of chemical wastes is a highly relevant issue in Mauritius as there are no treatment facilities and the disposal facility at Mare Chicose is limited. In addition, proper awareness of the hazardous nature of such wastes seems to be lacking. Owing to industrial diversification, there are growing amounts of chemical wastes from industrial activities in accordance with information provided above.

Although some manufacturing industries may possess small wastewater treatment plants for treatment their wastes but these

may not be adapted to treat all types of chemical wastes. For instance, effluents from paint industries are known to have a high content of heavy metals. Consequently chemical wastes from various sectors may contaminate the physical environment and health if adequate measures are not taken to prevent or limit their impacts. The country also has to manage increasing amounts of other hazardous wastes such as medical wastes or electronic wastes.

It is a common practice that chemical wastes generated are stocked within the users' facilities and information on final disposal is limited. It is apprehended that those users may eventually dispose of the chemical wastes along with general wastes or dumping them illegally on public grounds, within water bodies, under the soil or getting rid of them in abandoned plots of lands etc.

All hazardous wastes generators are required to liaise with the Ministry of Local Government and Outer Islands (MoLGOI), the enforcing agency for hazardous wastes in Mauritius, as per the Standards for Hazardous Wastes Regulations 2001 for the following tasks:

- Submission of inventories of hazardous wastes generated on a quarterly basis.
- Obtaining permission for the storage of hazardous wastes, packed and labelled as officially requested, within their premises
- Keeping records of hazardous wastes moved out of their premises for disposal.

Recently the MoLGOI conducted several workshops to increase awareness for sound disposal of hazardous wastes. With funding provided by the Africa Institute, it also outsourced a national study of wastes generated in Mauritius to the University of Mauritius which eventually produced a Hazardous Wastes Inventory (HWI) Report for Mauritius 2012 [10]. According to the HWI report, 16 800 tons of hazardous wastes were generated in 2011 in Mauritius and the amounts predicted for 2015 may be between 19 717 to 22 788 tons. Studies carried out in 2003 estimated that 8 000 tons of hazardous wastes were then generated and 10 700 and 12 159 tons were predicted for the years 2009 and 2014 respectively.

Considering all types of uses and application of chemicals in Mauritius, the exact quantities of chemical wastes generated are not available. However, the estimates of the volumes and types of hazardous wastes generated in 2011 do provide an indicative information on chemical wastes generated. It must also be reckoned that the validity of quantitative data on hazardous wastes is subject to an efficient data recording mechanism, continuous monitoring by enforcing authorities and the adoption of sound practices by the hazardous generators. Table 2.9. summarises the amounts of chemical wastes generated. It can be found that the storage capacities are highly inadequate for the different types of wastes generated.

Type	Amount generated	Management practices
Used oils	4 940 tons	Recycled or disposed of haphazardly
Sludge from wastewater treatment plants	1 610 tons	Landfilled at Mare Chicose landfill
Solvent-based sludge	173.4 tons	Incinerated
Liquid wastes (organic)	216 tons + 217 m ³	Treated before disposal
Solid wastes (inorganic) including used lead batteries	1 243 tons	Small quantities of specific types of solid hazardous wastes are disposed of in the hazardous waste cells at the Mare Chicose landfill. Around 80% of used lead batteries are exported for recovery.
Liquid wastes (inorganic) e.g. sulphuric acid from lead-acid batteries, cyanide wastes, lead acetate/Hg iodide filtrate, acidic or basic wastes from printing and publishing sector	254 tons	Haphazard disposal/stored in view of exportation

Other solid wastes including e-wastes	8 161 tons	Partly recycled, landfilled, stored at premises of generators and 'dumped' into the environment
Medical wastes from private healthcare facilities	201.1 tons	Incinerated
Obsolete & expired chemicals	0.32 tons + 35.1 m ³	Stored at premises of hazardous waste generators in view of exportation
Total (Approx.)	16 800 tons + 252 m³	

Source: HWI Report 2012 & MoLGOI

The HWI report indicated that the approximate total storage capacities being 700 tons + 217 m³ are inadequate compared to the approximate total amounts of generated wastes i.e. 16 800 tons + 252 m³ as mentioned in the above table. Accordingly the construction of an interim storage facility is expected to increase the storage capacities for the management of hazardous wastes.

(a) POPs as wastes

Mauritius is a signatory of the Stockholm Convention on Persistent Organic Pollutants (POPs) since 2004. During the preparation of the National Implementation Plan (NIP) for enabling activities of the Stockholm Convention on POPs, inventories of obsolete POPs chemicals in Mauritius were duly conducted. According to the NIP report [11], a few POPs pesticides, non-POP obsolete pesticides and Polychlorinated Biphenyls (PCBs) contaminated transformer oils were identified. Table 2.10 shows the POPs identified during the NIP on POPs.

Table 2.10: POPs identified during the NIP on POPs in 2004			
Category	Chemicals	Description	Amounts
Pesticides	DDT	Donated by the WHO to the MoHQL for vector control	127 tons
	Aldrin	Obsolete	13 litres
	Dieldrin	Apparently obsolete	8 litres
	Mirex	Container found in good condition	64 kg
Industrial chemicals	PCBs	Found in oils of transformers used to produce electricity.	19 tons
Unintended by-products	Dioxins & Furans	Released during combustion processes	26.5 g 'TEQ

Source: NIP on POPs, Ministry of Environment & NDU, 2005

'As estimated in 2003 by the UNEP Toolkit Document

To date, all POPs pesticides, contaminated transformer oils and soils have been disposed with the exception of about five tons of DDT which is kept for an eventual outbreak of Malaria should other alternatives fail to work. As part of the NIP, water and soil samples were collected and analysed at the ex-MSIRI Laboratory to elucidate if any POPs contamination had taken place into the nearby environments where the obsolete pesticides were stored. Out of the POPs inventoried, only DDT was detected in soils near the storage areas of the insecticide, at different concentrations ranging from 0.3 to 1 146.8 ppm. [11]

All contaminated soils amounting to 243 m³ from three areas where DDT were stored namely in Mahebourg, Fort George and Pamplemousses (about 90%) have been excavated and exported to Netherlands for disposal. Moreover, all POPs chemicals together with a total of 586 kg of non-POP pesticides have been exported to France for disposal, except the five tons of DDT mentioned above.

2.4.4 Available disposals options

There are inadequate facilities for the disposal of chemical wastes in Mauritius, resulting in the waste generators needing to resort to other means of disposals like physical means such as solvent recovery, chemical treatments or even export. In order to increase

the capacity of hazardous waste disposal, interim storage facilities at a dedicated site would be available by 2015 according to the Ministry of Local Government and Outer Islands (MoLGOI). The facilities available as of January 2014 are as follows:

(a) Mare Chicose Sanitary Landfill

The Mare Chicose sanitary landfill site found in the south-eastern part of the island. The site is under the responsibility of the MoLGOI but operated by a private company on a contractual basis. It receives all Municipal Solid Wastes (MSW) transported by licensed waste contractors from five transfer stations situated at different regions around the island. It is estimated that 60-70 % of the wastes received at the landfill are of organic nature. The landfill produces its own electricity through the methane generated. The site has a series of hazardous waste cells to receive some types of solid hazardous wastes which are eventually encapsulated within concrete. The HWI Report 2012 mentions that 25 tons of hazardous wastes were received at the Mare Chicose Landfill site in 2010 and another 13 tons were brought in as at October 2011.

(b) Medical wastes incinerators

The public hospitals and some private ones are equipped with incinerator to dispose of their medical wastes. As of January 2014, there are presently 16 such incinerators in Mauritius. The air quality within neighbouring areas of these incinerators is monitored.

(c) Wastewater Treatment Plants

The Wastewater Management Authority (WMA) operates under the aegis of the Ministry of Energy & Public Utilities. It has the responsibility of ensuring that hazardous liquid wastes are properly treated before disposal thereby protecting the public sewer network and the water courses in general against harmful substances.

As effluents from the manufacturing industries are usually more loaded with chemical pollutants compared to municipal wastewater, these industries are expected to treat their effluents at their own or shared facilities. Alternatively, these wastes are transported to transfer stations of the WMA by private licensed wastewater carriers. Through the sewer network, wastewater is piped for treatment at a few large-scale treatment plants, the largest one located at St Martin in the western part of the island.

(d) Other disposal options

As Mauritius is a Small Developing Island State, it has to face specific challenges for the management of hazardous wastes. Accordingly, it may not be economically viable to set up treatment/disposal systems for several hazardous waste streams as the quantities generated are too low, such that exportation of these wastes for recovery or disposal is the most practical solution. The few examples whereby hazardous wastes of chemical origin have been exported from Mauritius are as follows:

- Chemical wastes collected from secondary schools such as obsolete acids, alkalis and other solutions used in chemical analysis amounting to a total of five tons have already been exported to France for disposal.
- Under the Sustainable Management of POPs in Mauritius project, stocks of DDT including contaminated soils were exported by using funds provided by the GEF and supported by UNDP and the Government of Mauritius.
- Electronic wastes collected from various parts of Mauritius which consisted of old batteries, mobile phone, electronic circuits from old computers, mobile phones, and other devices, etc. have also been exported. These types of wastes normally contain toxic heavy metals and their compounds and are harmful for human health and the environment. Hence they require proper disposal considerations since chemicals can easily leach and lead to contaminations of various media.

- To encourage the environmentally sound management of e-wastes in Mauritius, with Government leading by example, approximately 14,000 units of e-wastes from public and parastatal bodies and weighing more around 87 tonnes on a combined basis have been sent for recycling in 2013. These units comprised of old computer parts like monitors, CPUs, keyboards, etc. as well as printers, photocopy machines and related IT equipment.
- Under the “Sustainable Management of POPs in Mauritius” project, the MoLGOI has benefitted from an agreement signed between the UNDP Mauritius Office and a private contractor to export around four tons of hazardous wastes generated mostly from public institutions for disposal in Belgium

2.5 SUMMARY OF LIFE CYCLE ASSESSMENT OF CHEMICALS

Table 2.11 gives a quantitative (for the imports) and qualitative snapshot of the chemicals and chemical products commonly used in the Republic of Mauritius. The chemicals and chemical products are presented in form of categories and have been classified as per the relevant economic sectors. Key aspects related for their management are stated such as the priority areas, recommendations and indicators of use. It should be noted that the import figures for the respective amounts and value (cif) of the chemicals and chemical products are for the year 2012 as made available by the Statistics Mauritius, have been rounded off to the nearest whole number.

Table 2.11.: Master Table for Life Cycle Assessment of Chemicals and Chemical products

Sectors used	Main imported chemicals & chemical products		General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health						Environment
<ul style="list-style-type: none"> • Agriculture (large, medium and small scale) • Farming • Livestock farming (deer and poultry mainly) • Forestry • Trials & Experimentations (R&D activities) 	Rodenticides	125	15	<ul style="list-style-type: none"> • Residues often contain several toxic and carcinogenic substances which can affect human health through the food chain. • People who are directly exposed e.g. plant-sellers, pesticide handlers can be a greater risk. 	<ul style="list-style-type: none"> • Some of their components persist in nature and do not decompose easily. • Soil and water quality easily affected in case of excessive usage. 	<ul style="list-style-type: none"> • Obsolete pesticides. • Spent solvents. • Empty bags and containers • Old equipment e.g. sprayers and mixers. • Wastewater after washing of equipment, protective clothing etc. • Batch of adulterated crops e.g. those with pesticide levels higher than stipulated MRLs. 	<ul style="list-style-type: none"> • No mechanisms for proper disposals and container management as of 2013 • Requires more enforcement on-site of use. 	<ul style="list-style-type: none"> • Crops, processed and raw foods, animal feeds, etc must be tested regularly for detecting presence of residues for regulatory controls. • Upgrading of capacities of testing laboratories. • Phasing out of banned pesticides • Respecting of harvest times after application of pesticides. 	<ul style="list-style-type: none"> • Proper training and awareness by AREU and other institutions • Sound uses are very important • Stringent registration for e.g. no change in solvent medium of the pesticides. • Recording uses at various levels (small & medium planters, cooperative societies or agricultural firms, etc.) • Targeting residues of newer pesticides during testing. • Promoting uses of safer alternative techniques. 	<ul style="list-style-type: none"> • Number of trade licenses, permits, or clearances issued. • Harvest times of locally grown crops. • Pesticide residues levels (MRLs) in local crops. • Blood-cholinesterase activity in sprayer-men. • Number of suicide attempts. • Number of workplace accidents and diagnosed diseases related to chemicals
	Herbicides	852	158							
	Fungicides	196	39							
	Insecticides	786	119							
	Others (anti-sprouting agents, plant growth regulators, etc.)	21	3							

Category I : Agricultural Chemicals

Sectors used	Main imported chemicals & chemical products		General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health						Environment
Category I: Agricultural Chemicals										
	Fertilisers	52 739	835	<ul style="list-style-type: none"> Direct users suffer from respiratory problems. Skin and eyes irritation also possible. 	<ul style="list-style-type: none"> Affect water quality by increasing mineral contents. Cause algal blooms and eutrophication when used excessively due to high Nitrogen, Phosphorus and Potassium levels. Soil quality if affected may in turn impact on normal plant growth. 	<ul style="list-style-type: none"> Obsolete fertilisers Empty bags and containers Old equipment e.g. sprayers and mixers. Wastewater generated by washing of equipment containing 	<ul style="list-style-type: none"> No mechanisms for proper disposal and container management as of 2013 Requires more enforcement on-site of use Contaminated water bodies and soils may in turn require chemical 	<ul style="list-style-type: none"> Monitoring of water and soil quality on a regular basis Upgrading of capacities of testing laboratories Respecting size of cultivated lands during application Conducting relevant studies to assess environmental impacts and to reduce dependency on chemical 	<ul style="list-style-type: none"> Number of trade licences, or clearances issued. Harvest times of locally grown crops Levels of chemical parameters e.g. NO₃ or K⁺ in waters or soils. Number of workplace 	
Category II: Petroleum products & related chemical products										
<ul style="list-style-type: none"> Energy production Transportation Services for vehicle maintenance Services for industrial maintenance 	Motor spirits	167 364	4 113	<ul style="list-style-type: none"> Direct users may suffer from respiratory problems from these substances and their combustion products Being flammable substances some of the products can catch fire easily or cause explosions i.e. pose risks of burns, injuries or death in severe cases. 	<ul style="list-style-type: none"> Affect water and terrestrial surfaces in cases of spillages or other types of accidents. Animal and plant life highly affected during spillages. Contaminated land areas may become infertile. Incomplete combustion may include toxic contaminants like Carbon Monoxide, unburnt hydrocarbons, etc. 	<ul style="list-style-type: none"> Empty containers e.g. barrels and drums Old equipment e.g. piping systems Used petroleum products e.g. motor oils or cooking oils. Substances emitted during combustion may include GHGs, VOCs, PM, unburnt hydrocarbons leading to air pollution, Global Warming and reduction in stratospheric Ozone. 	<ul style="list-style-type: none"> In case of major spillages, contingency plans must be deployed to prevent further damage Requires high levels of supervision on-site of use Contaminated water bodies and soils may in turn require chemical treatments. 	<ul style="list-style-type: none"> Proper maintenance and regular inspections by regulatory institutions at facilities where petroleum products are stored, used or distributed. Assisting in the creation of hazardous facilities mapping with the NDRRMC. Promoting use of cleaner fuels. 	<ul style="list-style-type: none"> Awareness and training on sound uses Enhancing greater understanding of inhabitants near major facilities for having better preparedness in case of emergencies Upgrading of capacities of laboratories for air emissions testing. Regular checks and inspections of engines and other motorised units 	<ul style="list-style-type: none"> Number of workplace accidents, spillages, fires, etc. Levels of chemical pollutants in air e.g. CO₂, SO₂, PM10, etc. Distance of major facilities from inhabited zones. Import volumes for petroleum products used as fuels.
	Gas Oils	381 622	9 545							
	Fuel Oils	410 214	8 234							
	Aviation fuel	263 947	6 462							
	Anti-knock preparations	110	11							
	Anti-freeze preparations	79	6							
	Lubricating oils & greases	172	22							
Additives for lubricating oils	30	5								
Hydraulic brake fluids	279	26								

Sectors used	Main imported chemicals & chemical products			General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health	Environment					
Category III : Industrial Chemicals (Textile, paint & related chemicals)										
• Textile manufacture • Clothing & apparel manufacture • Tanning • Paint manufacture • Glass manufacture • Glass painting	Dyes (Acid, Basic, Direct, Reactive, VAT, etc.) & dye preparations	665	24	<ul style="list-style-type: none"> Direct users may suffer from eyes, skin, respiratory or other more severe health problems in cases of overexposures Some substances used are highly toxic to humans or carcinogenic e.g. heavy metal or aromatic amino compounds present in the dyes, pigments, paints and colouring matter 	<ul style="list-style-type: none"> Affect water and terrestrial surfaces in cases of spillages or other types of accidents. Effluents from textile factories are highly polluting due to high COD levels Heavy metals like Lead and Chromium present in the dyes, pigments, paints and colouring matter can be harmful to aquatic life. 	<ul style="list-style-type: none"> Empty containers e.g. bags or drums Spent dyeing or paint solutions. Residual dyes, paint and other chemicals released during washing of dyeing machines Dyes, paints and other products which turned obsolete 	<ul style="list-style-type: none"> Requires treatment of effluents generated (a wastewater treatment plant) at factory levels May require transportation of effluents generated to public wastewater treatment plant High levels of supervision required 	<ul style="list-style-type: none"> Regular inspections by regulatory institutions at facilities where products are stored, used or distributed. Assisting in the creation of hazardous facilities mapping with the NDRRMC. Health checks of workers for skin and respiratory problems. Promoting use of less toxic substances 	<ul style="list-style-type: none"> Awareness and training of workers on sound uses. Investing in proper treatment facilities at factory level Waste disposals to become payable for factories. Upgrading of capacities for ambient air testing in-side factories. Regular checks and inspections Avoid transportation of chemicals intended in non-adapted vehicles 	<ul style="list-style-type: none"> Number of trade licenses, permits, clearances issued. Number of cases of workplace accidents, spillages, fires, etc. Levels of chemical pollutants in effluents e.g. COD, NO₃ etc. Distance of facilities from inhabited zones.
	Lubricants for textiles and leather, etc.	110	10							
	Pigments, luminophores, Optical brighteners, Colouring matter & related substances	1 825	212							
	Pigments used in paint manufacture	59	20							
	Pigments for glass, ceramic, enamel, etc	56	7							

Sectors used	Main imported chemicals & chemical products			General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health	Environment					
Category IV (a): Industrial Chemicals & Consumer Chemicals for the construction sector										
<ul style="list-style-type: none"> • Cement & building materials manufacture • Construction industry • Painting, refurbishment works, Surface-coatings & other related services 	Prepared additives for cements, concretes & mortars	429	26	<ul style="list-style-type: none"> • Direct users may suffer from skin, respiratory problems or other more severe health problems in cases of overexposures • Some substances used may be highly toxic or carcinogenic. • Organic solvents are also toxic e.g. Benzene is a proved human carcinogen. 	<ul style="list-style-type: none"> • Affect water and terrestrial surfaces in cases of spillages or other types of accidents. • Effluents and solid wastes generated are highly polluting • May affect water bodies or agricultural lands • Organic solvents can catch fire easily leading to further environmental harm. 	<ul style="list-style-type: none"> • Empty containers e.g. bags or drums, • Spent soldering electrodes or spent solvents. • Solidified concrete wastes that can lead to blockages to sewers, water canals, etc. 	<ul style="list-style-type: none"> • Though not an easy task, segregation of generated construction wastes is required • May require transportation of generated to Mare Chicose Landfill or temporary other sites 	<ul style="list-style-type: none"> • Regular inspections by regulatory institutions at facilities where products are stored, used or distributed. • Health checks of workers for respiratory problems. • More public awareness with regards to use of organic solvents. • Promoting use of renewable materials during construction 	<ul style="list-style-type: none"> • Awareness of workers and public on uses of organic solvents • Proper labeling of containers of solvents sold in retail • Waste disposals to become payable for factories. • Upgrading of capacities for ambient air testing in-side factories. • Regular checks and inspections at selling points of organic solvents 	<ul style="list-style-type: none"> • Number of trade licenses, permits, or clearances issued. • Number of workplace accidents, spillages, fires, etc. • Levels of chemical pollutants e.g. TSP, PM 10 or other particles in ambient air. • Distance of facilities from water-courses or agricultural lands.
	Non-refractory mortars & concretes	401	6							
	Pickling preparations, welding powders, fluxes, coatings, etc.	67	24							
Organic composite solvents & thinners	1 559	92								
Graziers, fillings, mastics, resin cements, etc.	275	32								
Non-refractory preparations for surfacing of walls, ceilings, floors, etc.	1 676	64								

Sectors used	Main imported chemicals & chemical products		General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health						Environment
Category IV (b): Industrial Chemicals for manufacturing plastics, paper and other products.										
<ul style="list-style-type: none"> • Manufacture of plastic materials, plastic products (bags food & beverage containers, water tanks & pipes, etc.) • Construction industry • Maintenance services • Manufacture of paper & paper products 	Polymers, (Polyalkenes, Polycarbonates, Polyesters, PVA, PVC, PET, PU, etc.) Co-polymers & derivatives	28 325	1 468	<ul style="list-style-type: none"> • Direct users may suffer from skin, respiratory problems or other more severe health problems in cases of overexposures • Some substances used may be highly toxic or carcinogenic. • Combustion of synthetic polymers release extremely toxic contaminants like Dioxins and Furans capable to bioaccumulate 	<ul style="list-style-type: none"> • Affect water and terrestrial surfaces in cases of spillages or other types of accidents. • Effluents generated may contribute to high organic load i.e. increased COD levels • Combustion of synthetic polymers release extremely toxic contaminants like Dioxins and Furans which persist in the environment. 	<ul style="list-style-type: none"> • Empty containers e.g. bags or drums, • Residual solid wastes during manufacturing processes. • Spent dyeing solutions used to manufacture colourful plastic objects. 	<ul style="list-style-type: none"> • Accumulated wastes badly disposed create environmental problems due to low biodegradation • Solidified plastic wastes that can lead to blockages to sewers, water canals, etc. • Polymeric substances can be recycled if collected. 	<ul style="list-style-type: none"> • Regular inspections by regulatory institutions at facilities where products are stored, used or distributed. • Health checks of workers for respiratory problems. • Promoting use of renewable materials during construction. 	<ul style="list-style-type: none"> • Awareness of workers and public on uses of polymeric substances and to prevent uncontrolled burning of municipal wastes which often consist of these substances. • Waste disposals to become payable for factories. • Upgrading of capacities for ambient air testing inside factories and laboratories to analyse levels of dioxins or furans. 	<ul style="list-style-type: none"> • Number of trade licenses, permits, or clearances issued. • Number of workplace accidents, spillages, fires, etc. • Levels of chemical pollutants e.g. PM 10 or other particles in ambient air • Weight of obsolete/old plastic & paper collected for recycling.
		Plasticizers & Stabilizers	82	9						
		Resins (Bakelite, Phenolic, Petroleum Amino-acids, etc.)	2 676	135						
	Silicones	133	83							
	Cellulose & derivatives e.g. CMC	478	65							

Sectors used	Main imported chemicals & chemical products			General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health	Environment						
Category V: Consumer chemicals (Non-textile chemicals used for colouration)											
<ul style="list-style-type: none"> • Services • Domestic uses • Used in offices & places of business • Industrial manufacturing processes 	Printing inks (for office, services and domestic uses)	401	109	<ul style="list-style-type: none"> • Direct users may suffer from skin, respiratory problems or other more severe health problems in cases of overexposures • Some substances used may be highly toxic or carcinogenic e.g. heavy metal or present in the paints and colouring matter 	<ul style="list-style-type: none"> • Affect air, water and terrestrial surfaces in cases of spillages or other types of accidents. • Effluents can lead to water pollution due to high COD levels and organic compounds. 	<ul style="list-style-type: none"> • Empty containers e.g. drums, ink cartridges, vials, etc. • Spent paint solutions. • Residual paint and other chemicals released during washing of processing machines • Paints and other products which turned obsolete 	<ul style="list-style-type: none"> • Requires treatment of effluents generated to public water treatment plant • High levels of supervision required 	<ul style="list-style-type: none"> • Regular inspections by regulatory institutions at facilities where products are stored, used or distributed. • Health checks of workers for respiratory problems. • Promoting use of less toxic and safer products for instance paints not containing lead. 	<ul style="list-style-type: none"> • Awareness and training of workers on sound uses. • Investing in proper treatment facilities at factory level • Waste disposals to become payable for factories. • Upgrading of capacities for ambient air testing in-side factories. • Regular checks and inspections at workplaces 	<ul style="list-style-type: none"> • Number of trade licences, permits, or clearances issued. • Number of workplace accidents, spillages, fires, etc. • Levels of chemical pollutants in effluents e.g. COD, organic contaminants etc. • Sales figures of imported products. 	
	Manufactured paints (with acrylic, vinyl or polyesters, etc. as active ingredients.)	595	147								
	Varnishes (with acrylic, vinyl or polyesters, etc. as active ingredients.)	150	26								
Category VI: Fireworks & Explosive Chemicals											
<ul style="list-style-type: none"> • Services (demolition works & navigation) • Domestic uses • Military uses 	Prepared explosives, signalling flares & other explosives	295	22	<ul style="list-style-type: none"> • May lead to severe injuries, burns or death in worst cases. 	<ul style="list-style-type: none"> • Affect water and terrestrial surfaces in cases of explosions • May release toxic gases into the air. • Some explosives have irritating properties 	<ul style="list-style-type: none"> • Empty containers e.g. bags • Ashes and debris (residual solid wastes) 	<ul style="list-style-type: none"> • Requires high level of supervision. • Disposals must not be done along with domestic or municipal wastes. 	<ul style="list-style-type: none"> • Regular inspections by regulatory institutions at facilities where products are stored, used or distributed. • More public awareness on sound uses 	<ul style="list-style-type: none"> • Inspections at selling points • Upgrading of capacities for ambient air testing to analyse chemical contents of fireworks. 	<ul style="list-style-type: none"> • Number of trade licences, permits, or clearances issued. • Number of accidents, burns, fires, etc. • Sales figures for fireworks. • Requests for demolitions 	
	Fireworks	519	34								

Sectors used	Main imported chemicals & chemical products			General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health	Environment						
<ul style="list-style-type: none"> • Services • Domestic uses • Used in offices, businesses and other workplaces excluding uses as ingredients in manufacturing processes. 	Category VII: Consumer Chemicals (Chemical products for cleaning, maintenance and hygiene)										
	Disinfectants	112	20	<ul style="list-style-type: none"> • Direct users may suffer from eyes, skin, respiratory problems or other more severe health problems in cases of overexposure • Accidental poisonings quite easy. • Some may contain toxic substances like Nonylphenols. 	<ul style="list-style-type: none"> • Affect water quality and terrestrial surfaces in cases of spillages or other types of accidents. • Cause algal blooms and eutrophication when used excessively due to high Nitrogen, Phosphorus and Potassium levels. 	<ul style="list-style-type: none"> • Empty containers e.g. bags, bottles, etc. • Wastewaters (domestic, industrial or commercial, etc.) • Obsolete detergent powders, waxes polishes and creams, etc. 	<ul style="list-style-type: none"> • Generally disposed along with other domestic or general wastes. 	<ul style="list-style-type: none"> • Regular inspections by regulatory institutions at facilities where products are used. • Good-house-keeping rules • Ensure proper training of workers. 	<ul style="list-style-type: none"> • Awareness of workers and public on proper uses of disinfectants • Proper labelling of products. • Health checks of workers for respiratory problems. • Upgrading of capacities for water-quality testing. 	<ul style="list-style-type: none"> • Number of trade licences or permits issued. • Number of workplaces accidents, e.g. inhalations or spillages etc. • Sales figures for these consumer products • Requests for cleaning & maintenance. 	
	Organic surface-active products & washing products	1 436	120								
	Ionic & Non-ionic surface-active products & washing products	1 176	102								
	Soaps & surface-active products for toilet uses	1 086	86								
	Soaps & surface-active products not for toilet uses	470	32								
	Scouring pastes & powders, preparations & other types of soaps	11 321	281								
	Polishes & creams for footwear, leather, furniture, wooden objects, etc.	133	17								
	Vape mats (mosquito killing)	57	24								

Sectors used	Main imported chemicals & chemical products		General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health						Environment
Category VIII: Food supplements & Pharmaceuticals										
<ul style="list-style-type: none"> • Medical treatment • Health-care services • Veterinary services 	Vitamins, pro-vitamins derivatives of vitamins & medicaments containing vitamins	31	13	<ul style="list-style-type: none"> • Excessive uses may lead to severe complications affecting the human body at organ or systemic levels. • Hormonal imbalance, reduced fertility rates and future progeny can be at risk in cases of excessive uses. 	<ul style="list-style-type: none"> • Medical wastes can affect water quality or ambient air. • Animal and plant life can be affected due to high amounts of spent pharmaceuticals generated (scientific evidence exists for sex reversals in species of birds, fish, toads, and other aquatic organisms) 	<ul style="list-style-type: none"> • Empty containers e.g. bottles, syringes, vials capsules, etc. • Wastewaters (hospitals, clinics, etc.) • Air emissions from medical incinerators • Biological samples (blood, urine, etc.) • Obsolete pharmaceutical products at hospitals, clinics, or even at home. 	<ul style="list-style-type: none"> • Requires treatment of effluents generated (wastewater treatment plant) at healthcare facility levels • Medical wastes need to be incinerated to prevent contamination • Requires high level of supervision. 	<ul style="list-style-type: none"> • Ensure that incineration and wastewater treatment of medical wastes are done in a sound manner as far as practicable. • Construction of modern waste incinerator (can be located away from residential and agricultural areas) • Ensure proper training of hospital workers involved in waste management. 	<ul style="list-style-type: none"> • Number of trade licenses, permits, or clearances issued. • Number of suicides, accidental ingestions or poisoning due to pharmaceuticals. • Sales figures • Number of prescriptions. • Levels of chemical pollutants released during incineration or detected in wastewaters. 	
	Medicaments containing hormones	18	44							
	Antibiotics & medicaments containing antibiotics	115	54							
	Vaccines & gels for human and veterinary medicine	51	66							
Category IX: Cosmetic & personal care products (Consumer Chemicals)										
<ul style="list-style-type: none"> • Services (Hotels, spas, beauty clinics, hair saloons, etc.) • Domestic uses 	Beauty products & Make-ups (lips, eyes, etc.)	1 430	1 152	<ul style="list-style-type: none"> • Direct users may suffer from eyes, skin, respiratory problems or other more severe health problems in cases of overuses 	<ul style="list-style-type: none"> • Affect water quality and terrestrial surfaces in cases of spillages or other types of accidents. 	<ul style="list-style-type: none"> • Empty containers e.g. bags, bottles, etc. • Wastewater (domestic, hotels, spas, other commercial, etc.) • Obsolete powders, waxes polishes and creams, etc. 	<ul style="list-style-type: none"> • Generally disposed along with other domestic or general wastes. 	<ul style="list-style-type: none"> • Regular inspections by regulatory institutions at facilities where products are used and sold. • Good-house-keeping rules for workers proper training of workers. 	<ul style="list-style-type: none"> • Number of trade licenses, permits, or clearances issued. • Number of workplaces accidents, e.g. inhalations or spillages etc. • Sales figures for these consumer products • Requests for cleaning & maintenance 	
	Shampoos & hair products (lacquers, strengtheners, etc.)	1 782	289							
	Dentifrices & oral hygiene preparations	589	121							
	Shaving lotions & creams	82	6 210							

Sectors used	Main imported chemicals & chemical products		General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health					
Category IX: Cosmetic & personal care products (Consumer Chemicals)									
	Deodorants, antiperspirants, perfumed bath salts & other preparations	394	95						
	Perfumes & toilet waters	596	353						
Category X: Miscellaneous Organic Chemicals									
<ul style="list-style-type: none"> Industrial manufactures (foods, paints, plastics, etc.) Industrial/lab. processes (e.g. solvent extraction & distillation, pH control) Food & beverages preservation Lab. testing R&D activities Healthcare & public health control Academia (secondary & tertiary institutions, private tutors) 	Hydrocarbons & derivatives (e.g. halogenoalkanes, halogenoarenes)	1 648	107	<ul style="list-style-type: none"> Affect water quality, ambient air and terrestrial surfaces in cases of spillages or other types of accidents. Many halogenated organic compounds lead to reduction in stratospheric Ozone. Organic chemicals, their residues or decomposition products can greatly affect the physical environment if released in large amounts Combustion or decomposition products may include extremely toxic contaminants like Dioxins and Furans, which persist in the environment. 	<ul style="list-style-type: none"> Empty containers e.g. bottles, bags or drums, etc. Residual solid and liquid wastes during manufacturing processes. Wastewater containing organic chemicals. Laboratory and medical/clinical wastes (e.g. used filter papers or cotton swabs containing chemicals) 	<ul style="list-style-type: none"> Requires different types of treatment of wastes generated Wastes from incompatible chemicals must not be disposed together (e.g. organic solvents and oxidising agents) Requires high level of supervision. 	<ul style="list-style-type: none"> Maintaining and upgrading of databases at various levels (imports, uses, storage, disposals, etc i.e. for the life-cycle of the chemicals.) Regular inspections by regulatory institutions at facilities where products are used. Good-house-keeping rules. Ensure proper training of workers. 	<ul style="list-style-type: none"> Awareness of workers and public on risks from the chemicals. Proper risk assessments at workplaces. Upgrading of capacities for ambient air testing inside factories, chemical stores, warehouses or related facilities 	<ul style="list-style-type: none"> Number of trade licences, permits, or clearances issued. Number of workplace accidents, spillages, fires, etc. Levels of chemical pollutants in air, waters, soils, etc. Sales figures
	Organic acids, Dioic acids & derivatives	1 292	49	<ul style="list-style-type: none"> Direct users may suffer from eyes, skin, respiratory problems or other more severe health problems in cases of overexposures. Injuries, burns, etc. also possible if substances that are corrosive, flammable or explosive, etc. are poorly managed. Some chemicals used may be highly toxic, immunotoxic or carcinogenic may reach man via food chains. 					
	Organic Nitrogen compounds (Amines, Amides, Amino-acids, Isocyanates, Nitriles, etc. & derivatives)	2 092	187						
	Alcohols, glycols, Phenols, ethers, epoxides & derivatives	977	51						
	Aldehydes, ketones, & derivatives	240	25						
	Esters, lactones, sugars, enzymes, heterocyclic compounds & other organic compounds	483	65						

Sectors used	Main imported chemicals & chemical products			General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use	
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health	Environment						
<ul style="list-style-type: none"> Industrial manufactures (foods, paints, plastics, etc.) Industrial/lab. processes (e.g. solvent extraction & distillation, pH control) Health care & public health control Food & beverages preservation Lab. testing R&D activities Water purification & sterilisation (domestic, industrial and large-scale purposes) Specialised industrial services e.g. jewellery/gemstone polishing, electro-plating Academia (secondary & tertiary institutions, private tutors) 	Pure gases (Oxygen, Argon, Nitrogen, etc.)	213 m ³	14	<ul style="list-style-type: none"> Direct users may suffer from eyes, skin, respiratory problems or other more severe health problems in cases of overexposures or acute exposures. Injuries, burns, etc. also possible if substances that are corrosive, flammable or explosive, etc. are poorly managed. Some inorganic chemicals used may be extremely toxic and prove to be fatal at low levels, e.g. cyanides. 	<ul style="list-style-type: none"> Affect water quality, ambient air and terrestrial surfaces in cases of spillages or other types of accidents. Inorganic chemicals & decomposition products can greatly affect the physical environment if released in large amounts. Oxides and hydroxides are oxidising and lead to corrosion, fires and other damage in the physical environment. 	<ul style="list-style-type: none"> Empty containers e.g. bottles, bags or drums, etc. Residual solid and liquid wastes during manufacturing processes. Wastewater containing inorganic chemicals. Laboratory and medical/clinical wastes (e.g. used filter papers or cotton swabs containing chemicals) 	<ul style="list-style-type: none"> Requires different types of treatment of wastes generated Wastes from incompatible chemicals must not be disposed together (e.g. organic solvents and oxidising agents) Requires high level of supervision. 	<ul style="list-style-type: none"> Maintaining and upgrading of databases at various levels (imports, uses, storage, disposals, etc i.e. for the life-cycle of the chemicals.) Regular inspections by regulatory institutions at facilities where products are used. Good-house-keeping rules. Ensure proper training of workers. 	<ul style="list-style-type: none"> Awareness of workers and public on risks from the chemicals. Proper risk assessments at work-places. Upgrading of capacities for ambient air testing inside factories, chemical stores, warehouses or related facilities 	<ul style="list-style-type: none"> Number of trade licences, permits, or clearances issued. Number of workplace accidents, spillages, fires, etc. Levels of chemical pollutants in air, waters, soils, etc. Number of assaults using acids/alkalis, etc. Number of suicides. Sales figures 	
	Category XI: Miscellaneous Inorganic Chemicals										

Sectors used	Main imported chemicals & chemical products			General impacts on		Types of wastes generated Impacts on wastes	Impacts on wastes disposal	Priority areas	Recommendations for SMC	Indicators of use
	Names/Types	Amounts (Tons) (year 2012)	Value (MUR Millions)	Human Health	Environment					
	Category XI: Miscellaneous Inorganic Chemicals									
	Halogenated- oxo compounds (Chlorates, Hypochlorites, Perchlorates, etc)	1 640	48							
	Other complex compounds (silicates, dichromates, manganates, etc.)	507	14							

2.6 RECOMMENDATIONS

2.6.1 Implementing new activities for trade & registration of chemicals

Currently chemicals are not tested at importation stage and are given clearance based on Safety Data Sheets, certificates of conformity from manufacturers or other related documents. Consequently, it is recommended to introduce basic testing of chemicals, in order to avoid any malicious cases where documents provided are not in accordance with the actual chemicals. Accordingly, samples from imported chemicals can be tested for the following cases :

- Cases of suspicious consignments of chemicals.
- For chemicals being imported for the very first time.
- For a chemical emanating from a new manufacturer, whose products have never been imported before.
- For chemicals being imported by new local traders or distributing agents.
- For cases where supporting documents do not provide key information or are not in English Language.

The single window system under development by the CD would facilitate the process of licensing and registration of chemicals whereby traders would be able to submit relevant applications electronically instead of the current practice. Advantages of the system would be as follows:

- It would minimise the lead time for movement of goods from the importation stage to the trader's or end user's facilities.
- Online payments can be eventually introduced for the respective licences or permits after the full implementation of the system.
- The system can be a 'one-stop shop' for traders having to comply with more than one regulation to apply for their respective licences and permits. For instance, they may have to satisfy conditions of legislations other than those pertaining to chemicals or inflammable substances, for instance regulations on fire safety, plant protection or radiation protection, etc. Accordingly, the system would be facilitating trade activities.

The specific schedules of the DCCA do not cover all chemicals that are imported, but clearance is required for all chemicals that are used for various purposes. It is recommended to amend relevant sections of this legislation to cater for chemicals which to date are unclassified.

It must be pointed out that industrial statistics compiled by Statistics Mauritius does include data for the production of 'basic chemicals' while Mauritius does not have any primary production of chemicals i.e. from minerals, petroleum products, etc. Moreover, production figures can also be generated from local trading companies further to repackaging of imported chemicals into new containers for re-exportation or local consumption. Accordingly to avoid any confusing data, it is recommended that the classification and generation of the industrial statistics pertaining to chemicals be reviewed for a more accurate description.

2.6.2 Preventive approaches related to the uses & storage of chemicals

Large users of chemicals are concentrated within industrial zones which are located mostly within 5 – 50 kilometres of Port Louis harbour. The port is equipped with adequate facilities to receive chemicals in bulk, however it is located close distances to inhabited regions, office buildings and other public areas. It is recommended that the public at large be made more conscious of the hazardous nature of the facilities which the port areas house.

The operation of hazardous facilities may easily have environmental, health or safety impacts on inhabited regions, industrial

zones, places of business as well as the physical environment especially if located close to such hot-spots. Accordingly, it is recommended that private sector stakeholders extend assistance to future hazard mapping exercise in Mauritius.

Proper planning must be made for land uses so that future hazardous facilities containing chemicals such as bulk depots of fuels are not in juxtaposition with residential or office areas, etc. It is further suggested that strict guidelines be set for the demarcations of such areas from any future hot-spots based on distance, amounts of chemical substances stored or other properties like toxicity, flammability or explosiveness.

2.6.3 Better management for the transport & distribution of chemicals

It is found that some goods vehicles may transport chemicals along with other goods simultaneously. On the other hand, some trading companies and end-users of chemicals employ contractual vehicles which may not be specifically adapted for the carriage of chemicals. In this respect, it is recommended:

- To mark vehicles with the inscription of ‘chemical goods vehicles’ so that they can be easily discerned on public roads with appropriate coloured markings and display of warning notices as stipulated by local and international legislation.
- To introduce special renewable licences for the proposed ‘chemical goods vehicles’ that can be issued by the NTA in consultation with the DCCB and the MPF.
- To discourage simultaneous transport of chemicals and other goods especially for contracted vehicles.
- To give the drivers of vehicles carrying chemicals the appropriate training by their employers and must be well aware of the risks that can exist due to their carriage.
- For some chemicals, depending on their physical properties, specially designed vehicles equipped with temperature controls, exhaust ventilation systems, spillage kits or other conditions/safety devices are used in accordance with their Safety Data Sheets (SDS.)
- To subject the vehicles transporting chemicals especially the bulk carriers to a frequent maintenance programme and to equip them with proper alarm systems in cases of emergencies.

2.6.4 Further implications on uses of chemicals

It is highly recommended that appropriate national databases and inventories of chemicals be created to enable a proper chemical information management system keeping records of all traders as well as nature, origins, dates, quantities or other pertinent information on the chemical substances imported by them. Databases can be further developed to provide information on other parts of the life cycle of chemicals which would help understand how they normally travel from imports to disposals.

It has also been observed that some industrial groups claim to be using environment-friendly substances for example solvents which are water-based in replacement of the conventional but harmful organic ones. Such statements must be confirmed by recommended on-site inspections by regulatory authorities and also by further laboratory analyses via the testing of effluents or emissions generated during their processes.

An important issue which must be addressed concerns the conditions in which chemicals are stored in a factory. Should the latter stop its routine operations, for instance after having been served with official notices from enforcing authorities or after going into receivership, there should official guidelines as to who would be taking responsibility of its chemicals stocks and any further liabilities.

2.6.5 Addressing matters for disposals of chemicals

There is an acute need to have proper disposal systems and facilities in place for chemical and hazardous wastes generated in the country.

A form of 'Polluter Pays Principle' must also be adopted by enforcing authorities in order to discourage unsound disposals of chemicals especially from large users. This would also help in leveraging funds for the treatment and overall management of chemical and hazardous wastes.

Finally the introduction of disposal fees for chemical wastes must also be worked out in a fair manner while taking into account the volumes being disposed of, their toxicity, as well as transport costs to the future disposal facilities on public roads.

Chapter 3

IMPACTS AND CHALLENGES FOR THE MANAGEMENT OF CHEMICALS

Chemicals play a very important role in our lives involved right from the creation of basic human needs to the functioning of complex particle accelerators. Lessons learnt from undesirable events such as the Minamata tragedy in Japan, the Seveso accident in Italy or the Bhopal disaster in India should be a reminder of chemicals' potential to cause severe damage.

In addition to the health and environmental consequences presented by harmful chemicals, these impacts can be also translated into direct and indirect costs such as medical treatments, repairs, insurance costs, water or soil decontamination costs, etc. further to any undesirable event or situation. As the management priorities are bound to differ country-wise, they have to be addressed in certain harmonised ways at the international level to enable a common understanding of chemicals by society. When considering management of chemicals, any inaction as a result of poor or reduced concerns about chemicals tends to be eventually costly to society.

3.1 ENVIRONMENTAL, HUMAN HEALTH AND SOCIO-ECONOMIC IMPACTS

The following sections describe challenges with chemical management in Mauritius, whereby emphasis is being laid on the impacts of chemicals on the environment, human health and on socio-economic aspects.

3.1.1 Impacts on environment

The physical environment namely air, soils, rivers, lands, aquifers, lagoons, etc. are at risk as a result of the unsound management of chemicals. Industrial processes, agricultural practices or other types of activities often tend to contaminate the environment whereby chemical substances are either generated as waste products or used in surplus amounts. In the specific case of Mauritius, the impacts on the environment are described below:

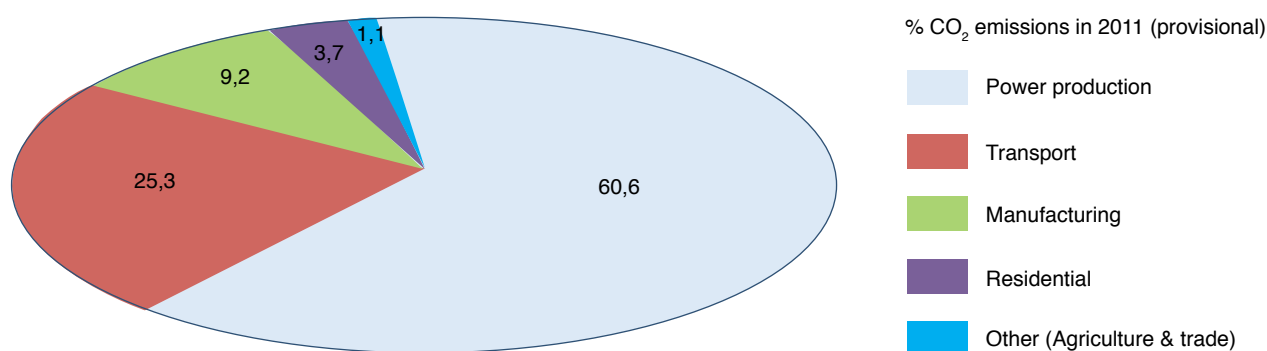
(a) Air Pollution

This is mainly due to the release of gaseous combustion products and by-products like Carbon monoxide, Carbon dioxide (CO₂), Oxides of Sulphur, Oxides of Nitrogen, particulate matter (measured as PM_{2.5} or PM₁₀), VOCs, etc. Many of these being GreenHouseGases (GHGs), they have been scientifically found to contribute to global warming which in turn has a direct impact on the world's climate. Moreover, there are various other polluting substances emitted in the air depending on specific activities; some of these substances may be quite toxic for instance Formaldehyde, Ozone, or the ill-famous Dioxins and Furans which are released unintentionally during burning.

Sectors and activities which contribute to air pollution in Mauritius are the following:

- Electricity production from fossil fuels as this energy sector represents the largest emitter of CO₂.
- The manufacturing sector, as many industries use fuel oil as a combustible source of energy to operate their burners and engines.
- The transportation sector, since most of the road transport vehicles are powered by fossil fuels. The country has also witnessed a rapid growth of private vehicle ownership over past few decades, whereby the number of vehicles per km of road was 190 in 2011 compared to 137 in 2001 according to the NTA.
- The sugar cane industry also contributes to air pollution especially during harvesting season when sugar mills come into operation but also due to fires in sugar cane fields either intentionally or as a result of arson.

Figure 3.1: CO₂ emissions sector-wise



- A very severe form of air contamination arises by the operation of waste incinerators found at medical facilities such as the public and private hospitals and private companies. Medical wastes normally comprise of chemical substances used as pharmaceuticals, drugs, and biochemical fluids, testing solutions, as well as disposable materials made up of PVC containing plastics and glass, spent medical devices and equipment, spares parts amongst others. Unless controlled, the combustion of medical wastes releases toxic chemical substances such as dioxins, furans as well as heavy metals in the surrounding environment.
- Sporadic cases of fires to get rid of accumulated solid domestic wastes on public, abandoned or private lands as a result of arson or intentionally. As the exact nature or composition of such wastes is unknown, harmful substances may be present in them, and consequently, toxic substances like dioxins or furans can be in turn released through these uncontrolled fires.

(b) Water Pollution

Water pollution has an impact on the quality of groundwater, surface waters and even marine waters. The handling, use, storage or transportation of chemicals at industries, commercial enterprises, or other types of businesses, as well as effluents generated thereof, may be responsible for water pollution. Moreover, activities undertaken at domestic levels also contribute to pollution since chemical substances are present in a wide range of consumer products like detergents, cleaning solvents, etc. In the specific case of Mauritius, areas of concern are as follows:

- The agricultural sector is one which is traditionally responsible for water pollution as runoffs of agrochemicals e.g. nitrogenous fertilisers normally reach water bodies like rivers and even lagoons. In the specific case of Mauritius, effluents emanating from agricultural farms with livestock, sugar mills or small-scale planters' fields have led to water

pollution. Subsequently, effects like eutrophication (algal blooms) or 'red tides' phenomena have also been observed in certain areas.

- The textile industry has been one of the heavy polluters of water resources in Mauritius. In the late 1970s, further to the gradual reduction of sugar cane mills in Mauritius, a few textile manufacturing companies started operating. It was the beginning of the textile industry which slowly flourished to become an important contributor to the economy since its products are export oriented just like sugar. The textile industry is actually a major consumer of chemicals through different processes involved therein right from the natural fabric to the manufactured garment. It is estimated that the textile industry uses above 1 000 tons of chemicals annually.

The most commonly used fabric i.e. cotton, in the form of yarns, must first be scoured in an alkaline medium of caustic soda or bicarbonate of soda, this is followed by bleaching with agents like sodium hypochlorite.

Dyeing which is a key process in the textile industry uses different types of chemicals namely a solution medium, the dye-stuffs and textile auxiliaries which are chemicals which help the efficiency of the process for e.g. enabling the dyes to fix onto the fabrics or giving a final optical effect to the product. In some cases, for e.g. during the dyeing of jeans, instead of dyestuffs, lakes or pigments, which often contain toxic metal compounds, are employed. After dyeing, the use of chemicals is prominent as the garments must be washed to remove unfixed dyes during the finishing processes.

Unfortunately, water pollution due to the textile sector is common, whereby fish kills in rivers, estuaries or other water bodies have been reported. This industry is also a major energy consumer and emits high volumes of waste gases and smoke through the running of their boilers. Accordingly, some textile manufacturing companies are the biggest polluters in Mauritius and have been served with notices by the Ministry of Environment & Sustainable Development. In conclusion, as the local textile industry is compelled to comply with environmental regulations, it also has to ensure its own sustainability by retaining jobs within the scope of Mauritius' socio-economic progress.

- Marine pollution due to ships discharging ballast water used fuel oils or in cases of accidental spills occurring within the sea waters around Mauritius. The latest case of oil spill was in June 2013 when approximately 7 000 tons of oil leaked in sea water within port areas.

(c) Soil Pollution

Chemical substances or wastes can highly impair soil quality if they are released onto or near agricultural lands. The situation is worsened in case there is a lack of proper disposal facilities or due to unsound practices whereby a chemical and their containers may be left unattended eventually leading to stockpiles. Such situations can easily lead to the contamination of soils as improperly stored chemicals would seep out of deteriorating containers.

Chemical wastes if not properly disposed of, may get mixed up with MSW and transferred to the Mare Chicose Sanitary landfill site. Another scenario may be that chemical wastes are disposed illegally near agricultural, forests or abandoned lands. Since it was inventoried in 2005 that the country had approximately 128 000 Ha of lands used for agricultural and farming purposes including lands covering forests and shrubs, such pollution can have further consequences on the phyto-sanitary quality of the produce.

The most serious concerns impacting on soil quality are as follows:

- Disposal of chemicals, chemical wastes or containers of chemicals, as a result of lack of awareness and the lack of treatment and proper disposal facilities.
- Over-utilisation of products agricultural chemicals such as pesticides, fertilisers, etc. which are eventually absorbed by soils.

- Disposal of liquids wastes like used engine oils or untreated wastewaters from industrial manufacturing units which may be deliberate though illegal.
- Storage of obsolete chemicals which can contaminate nearby soils even at low levels. The best example is the stock of DDT, insecticide intended for vector control during malarial outbreak which was lying for years at the facilities of the MoHQL. As mentioned in Chapter 2, only five tons of DDT is remaining from the original 137 tons inventoried.

In conclusion, it must be noted that the impacts of chemicals as pollutants on the physical environment are routinely monitored by different organisations such as the Ministry of Environment and Sustainable Development, the Central Water Authority, Wastewater Management Authority, etc. as per their mandates. As would be seen in the next Chapters, these institutions possess laboratories and other testing facilities. In addition, previous studies have also been specifically conducted to probe into such impacts, for instance Environmental Management of Industrial Estates. [17]

3.1.2 Impacts on health

Chemicals can cause harm to the human body producing ill-health effects like burns, irritations, impairment of vision, paralysis or diseases. In the most severe circumstances, some chemicals can lead to death. These can also be considered on the basis of exposure to chemicals whereby short-term and long-term effects inflict harm to the body. Chemicals are often described as per their hazardous nature to the body for instance carcinogenic (cancer causing), mutagenic, reprotoxic, immunotoxic or endocrine-disrupting.

There are various situations whereby chemicals can pose risks to health, these include long-term exposure, spills or accidents during routine uses within workplaces, accidental releases during transporting, intoxications via food consumed or simply through an act of a suicide. It must be pointed out that vulnerable groups include children, pregnant women, elderly people, and workers dealing directly with chemicals.

Chemicals cause harm to the human body as they come into contact with organs and organ systems. A few modes of entry of chemicals into the human body are as follows:

- Physical contact and skin absorption
- Ingestion
- Inhalation
- Ocular absorption
- Injection

In this respect, activities ranging from routine health checks to in-depth scientific studies may be conducted in view of determining the impacts of chemicals on health. Normally, studies conducted on targeted sections within a population for e.g. young children, workers or pregnant women, produce results of greater interest. However, in Mauritius there have been only a few in-depth scientific studies conducted at national level. Consequently, there is little available data to establish links between chemicals and health that would have shed more light in preventive medicine or occupational medicine. Such studies require lots of expertise, resources and in some cases, expected conclusions are normally available in the long term.

During emergency situations, some specific activities have been conducted on impacts on health from chemicals such as Asbestos fibre count on workers and Laboratory analysis of samples of imported infant milk further to reported cases of melamine (an industrial chemical) contamination.

The on-going activities in relation to impacts on health due to chemicals are as follows:

- Pre-employment and periodic medical examination of high risk workers done by the Occupational Health Unit (OHU) of the MoHQL and private medical practitioners are called upon to investigate into cases of ill-health due to chemicals.

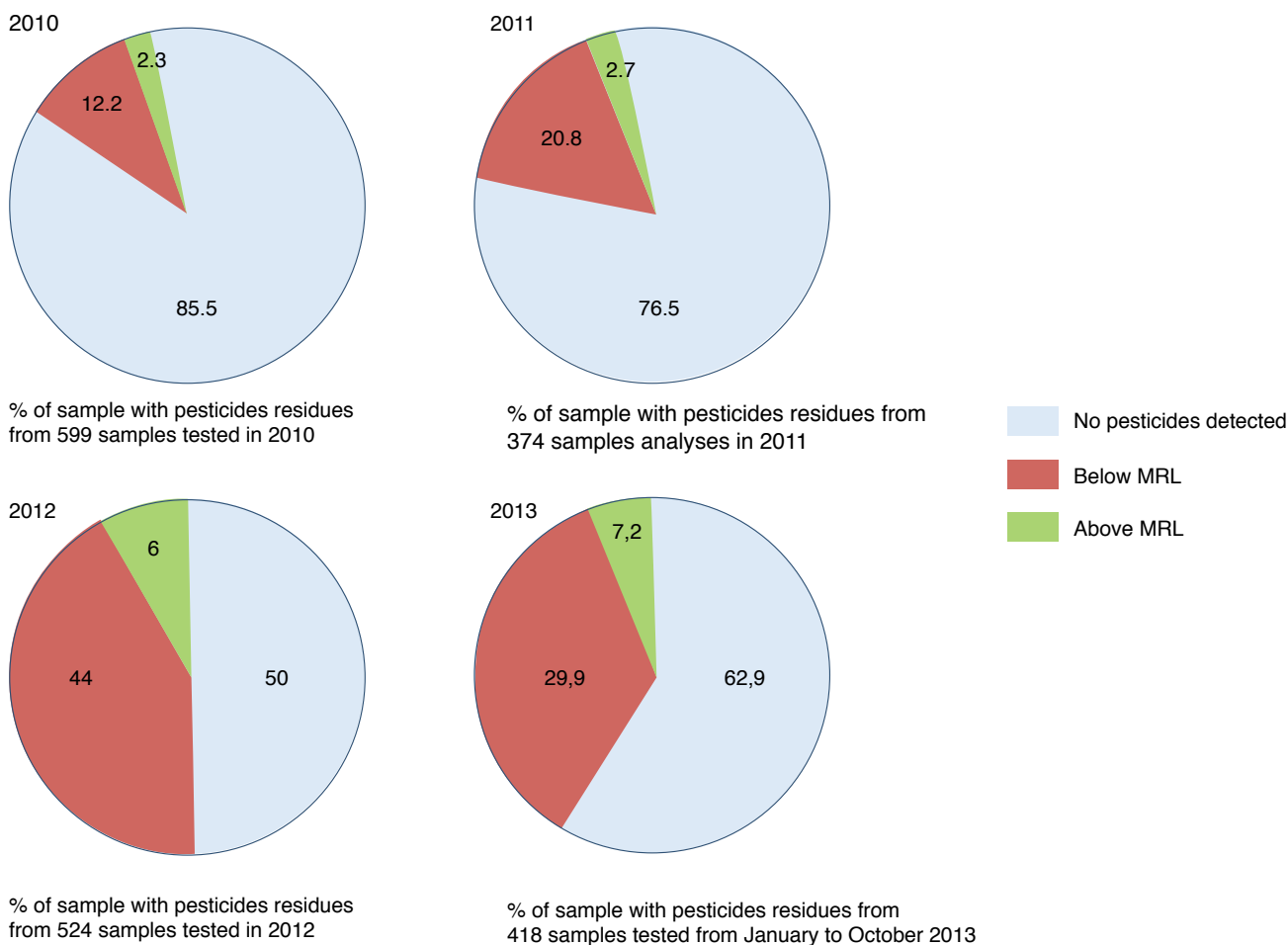
- Investigation into specific intoxication or suicide cases due to chemical substances for example the insecticide Paraquat.
- Biological monitoring: Testing of cholinesterase activity in the blood of workers involved in the spraying of pesticides used in agriculture or in public health control.
- Analysis of local fruits and vegetables purchased from planters to detect any pesticide residues. Two Governmental institutions are involved in this monthly exercise, further details are given in the next section.

3.1.3 Chemical residues in foods

Chemical residues in foods, either unprocessed or processed are known to create numerous concerns for human health. For instance, chemicals like pesticides are often linked to diseases such as cancers further research and scientific studies conducted. In Mauritius, no specific health studies have yet been conducted to establish formal links between any forms of Cancer and the use of pesticides used in as of January 2014.

Routine monitoring of pesticide residues in locally produced agricultural crops can offer some baseline data to any future studies on diseases or conditions affecting human health. The following four figures i.e. Figures 3.2 (a) – (d) show the results of laboratory testing of samples of local fruits and vegetables for pesticides residues since 2010. The monitoring involved a collaboration between two institutions of the Ministry of Agro-Industry and Food Security (MoAIFS) namely the Agricultural Research Extension Unit (AREU) responsible for collecting samples of local fruits and vegetables from planters and the Agricultural Chemistry Department (ACD) responsible for conducting laboratory analysis at its sister department, the Food Technology Laboratory. The levels of the tested pesticides were compared with Maximum Residue Levels (MRLs) stipulated in the Codex Alimentarius, Food and Agriculture Organisation (FAO).

Figure 3.2: Pesticide residues in local vegetables and fruits (2010 - 2013)



It can be noted that the percentage of samples in which pesticides were detected were less than 30 % in 2010 and 2011, while in 2012, this value increased to 50 %. However, the percentage of samples in which the pesticides exceeded MRLs was less than 10 % in all the four years. The fluctuations of the results depend on various factors such as the time intervals from the application of the pesticides and the laboratory analyses or the climatic conditions before the fruits and vegetables were collected as samples, the active ingredients tested etc., the actual samples tested. In cases where the MRLs were exceeded, the planters were advised by the AREU officers to improve the application of the pesticides.

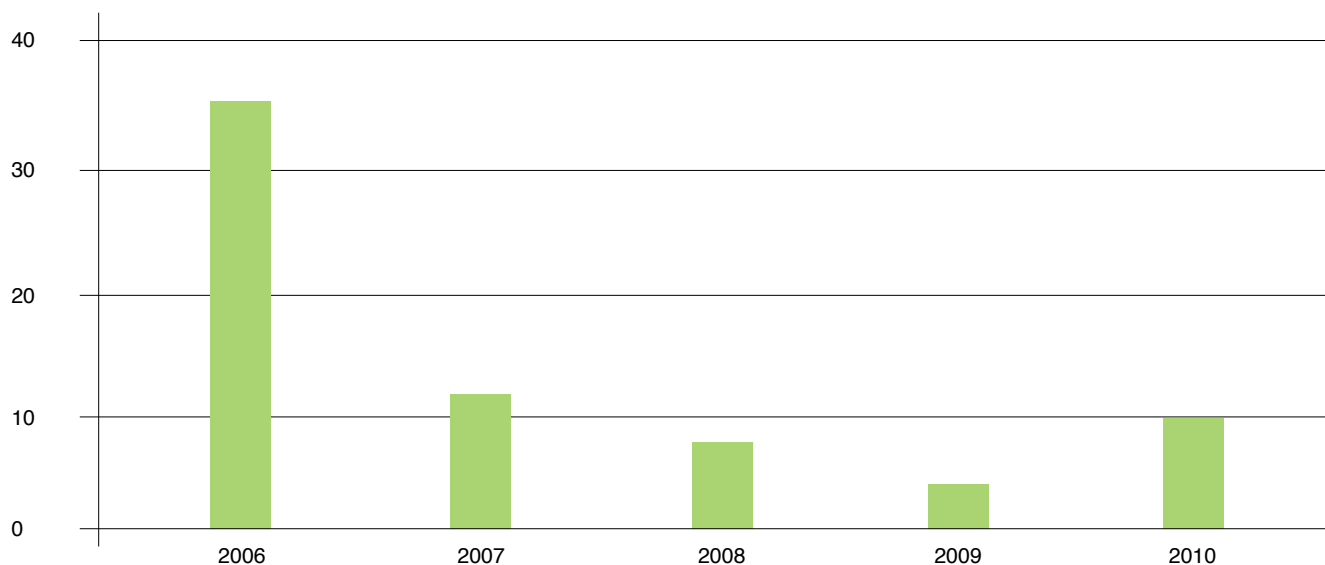
It must also be pointed that laboratory analyses of seafood products like fish and molluscs is carried out by the Albion Fisheries Research Centre of the Ministry of Fisheries to detect levels of chemicals like heavy metals. Since most of the seafood products are exported, the local authorities have to ensure that levels do not exceed stipulated limits. For this purpose, samples are sent to approved laboratories to detect such levels for instance the EU limits of 1.0 mg/kg Mercury in fish and 0.5 mg/kg Mercury in crustaceans. It was found that none of ten samples of fish tested exceeded the stipulated limit in 2012.

3.1.4 Chemicals affecting workers' health

As regards the health of workers, especially those who handle chemicals or are exposed to chemicals routinely, periodic medical examination are arranged by their employers.

The Figures 3.3 to 3.5 display the number of recorded cases of poisoning and overexposure on workers as diagnosed by the physicians of the Occupational Health Unit (OHU) of the MoHQL. As the figures are only for workers from Governmental institutions who were checked at the Occupational Health Clinics i.e. not obtaining health care services at Casualty wards of the major hospitals or health facilities of the MoHQL, they do not give a complete indication of all occupational cases observed nationwide. More importantly, similar figures from occupational health physicians who operate in private practice or at company levels are generally not available. Given that the private sector houses most of the hazardous facilities, workers from this sector are liable to be more affected by chemicals at work. Accordingly, the number of cases could be higher if health surveillance data of workers from the private sector were to be available.

Figure 3.3: Number of pesticide poisoning/Overexposure from 2006 to 2010



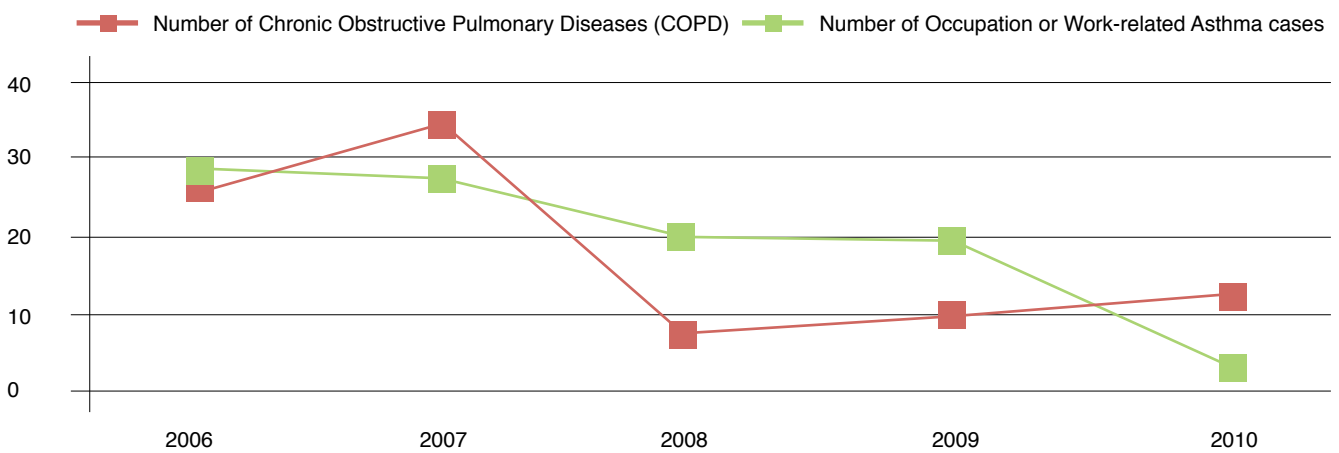
One reason for the lower number of cases for the period 2008 to 2010 compared to 2006 is the change in formulation of the pesticides further to the recommendations of the DCCB for traders of pesticides. It is obvious that the liquid formulations are more susceptible to affect workers as they can splash off easily on the body if not well handled or poorly managed at the traders' and users' premises.

Figure 3.4: Number of reported cases of organic toxic syndrome from 2006 to 2010



As seen in the above figure, the total number of cases diagnosed for the period 2006 to 2010 was less than 25 at the above mentioned health facilities. There are relatively few medical professionals who have specialised for the practice of Occupational medicine in Mauritius. Accordingly, cases of workers' health are often attended by a general medical practitioner.

Figure 3.5: Number of respiratory diseases recorded from 2006 to 2010



Respiratory diseases can also occur due to human lifestyles, while in the above cases, workplaces with dusty environments and emitting airborne contaminants led to the appearance of the signs and symptoms in the workers examined. In addition to the above-diagnosed conditions, there had been three cases each for the following conditions in the same period i.e. 2006 to 2010:

- Lead over-exposure
- Intoxication (other than solvents)
- Eye allergy to chemicals

After 2010, all medical conditions were recorded as per the International Labour Organisation (ILO) List of Occupational Diseases [15] which includes a whole list of diseases caused by chemical agents in its first part. The figures for 2011 are shown in Chapter 5 (section 5.1.1)

According to the 2011 Health Statistics Report [16] published by the MoHQL there were 584 cases of deaths in the year 2011 due to external causes out from a total of 8 951. A few causes which are related to chemicals also feature in the figure of 584 deaths as seen in Table 3.1.

Table 3.1: Selected number of deaths related to chemical substances

Cause (ICD – 2010)	Age of victims (years)							TOTAL
	Under 1	1 – 4	5 – 12	13 – 19	20 – 39	40 – 59	60 & over	
Exposure to Smoke, Fire and Flames	1	3	2	2	7	10	3	28
Suicide by drugs, medications and biological substances	-	-	-	-	1	-	-	1
Suicide by chemicals and noxious substances	-	-	-	1	11	16	6	34
Accidental poisoning by exposure to noxious substances and/or of undetermined intent	1	-	-	2	11	7	5	26

Source: Health Statistics 2011, MoHQL

¹ According to the International Classification of Diseases (ICD) 2010, World Health Organisation

3.1.5 Socio-economic impacts

The world has gradually witnessed a major intensification of chemicals usage in different sectors. The transport, services, manufacturing, agriculture, healthcare or other key economic activities are becoming more and more dependent on chemicals. Indeed, the growing need for chemicals in the society is synonymous to consequences other than health-related and environment-related ones within the different stages of the life cycle of chemicals namely trade, transportation, use, storage and disposal. Accordingly, the exploitation of chemicals also have social and economic impacts which are becoming increasingly recognised. These impacts can be broadly identified by the following direct and in direct indicators below in a no-priority order.

(a) Financial implications

- Monetary value for chemical trade including payable taxes.
- Insurance payable for stakeholders (manufacturers, transporters, workers, waste recyclers, etc.)
- Compensations and pensions (social security) payable to workers as a result of occupational injuries or diseases contracted by exposure with chemicals.
- Healthcare costs to provide medical treatment and palliative care to people affected by different challenges like food intoxications, pollution (mainly air and water), accidents, surviving suicide attempts which are related to chemicals, etc.
- Disposal and recycling costs as chemicals reach the end of their life cycle borne to hinder any eventual impacts on health and environment.

(b) Work-related performance implications

- Productivity and attendance at work may suffer due to chemical-related accidents and diseases (actually measured in terms of lost person-days.)
- More frequent recruitment requiring training for new personnel.

- Faster ageing and early retirements as a result of ill-health conditions, over-medication, use of drugs, smoking,
- Greater emphasis on worker, equipment, premises and other assets' protection at workplaces requiring use of appropriate control and monitoring measures such as use of signage, protective clothing or equipment.

(c) Personal and other implications

- Greater importance on awareness raising within the society so as to protect people against the hazardous nature of some chemicals properties.
- Burden of living for people with infirmity or contracting a disease as a result of chemical related accidents, misuses of chemicals.
- Difficulties in adapting in contemporary society which can lead to social exclusion, reduced chances to found a family or to obtain a job. These may be applicable for victims of misuse or bad management of chemicals and also for persons with hormonal imbalances as a result of exposure to chemicals.
- Low attendance at schools which may result in a reduction of academic performance
- Exposure to neuro-toxic chemicals like Lead can cause a diminished IQ in human beings.

3.1.6 Socio-economic impacts in Mauritius

In Mauritius, socio-economic impacts are also felt as chemicals are being more and more utilized in different forms, and for various applications. In different working environments, for the agricultural sector, within the educational sector, or even at home, it is found that uses of chemicals are more prominent compared to 50 or 60 years back. This fact can be correlated with gradual changes happening in lifestyles for instance, the Republic of Mauritius is increasingly turning into a consumer-based society. The following sections describe some impacts that can be noticed in the country.

(a) Financial implications

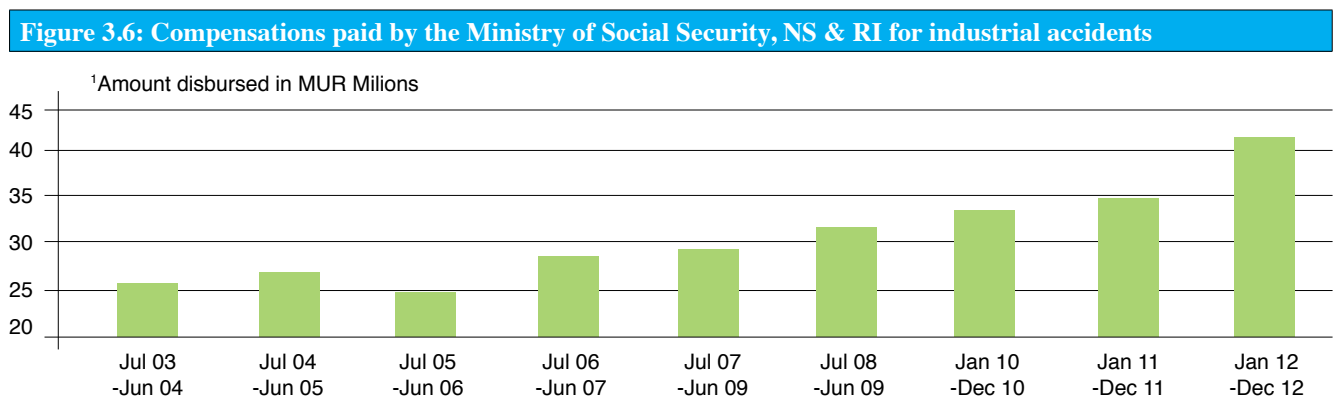
- The amount of money paid to insurance companies for insuring its staff involved in handling of chemicals mostly applicable for private sector enterprises, and for vehicles used in transportation of chemicals by road.
- Taxes payable for some products like machinery, vehicles or equipment releasing Carbon dioxide or CFCs.

(b) Work-related implications

- Compensation payable to workers

Any worker meeting with an accident at the workplace and becoming temporarily unfit for duty is given a nominal number of days of rest. In cases of notifiable accidents, the Ministry of Labour, Employment and Industrial Relations must be informed. The injured worker is still entitled to his or her full salary though the situation normally leads to an absence at work. However, after 15 days in such a condition, the worker is allowed to seek for compensation from the Industrial Injury Division (IID) of the Ministry of Social Security, National Solidarity and Reform Institutions provided he or she is a contributor to the National Pensions Fund (NPF). There are different applicable conditions for disbursement of such compensations.

Compensations payable to any beneficiary further to an accident at work require that the Industrial Injury Division is remitted official documents emanating from hospitals or other medical facilities both in public and private confirming the exactness of the case. Figure 3.6 shows the amounts of money disbursed by the Government as a result of all types of industrial accidents between 2003 -2012.



Source: Digest of Social Security Statistics 2011, Statistics Mauritius

¹ As from 2010, the financial year starts from 1 January and ends on 31 December in Mauritius.

The system in place does allow compilation of data on accidents occurring in different economic sectors including the nature of injury (e.g. body locations of the affected persons). However, a very low number of cases of industrial accidents reported to the IID and subject to compensations are due to exposure or contact with chemicals. The agricultural sector, manufacturing sector and construction industries are the main sectors where compensations are paid usually further to exposure or contact with hazardous substances and radiation, i.e. accidents which are directly concerned with chemicals. Table 3.2 shows the number of cases reported from various economic sectors in 2010 and 2011.

Table 3.2: Number of cases of exposure to chemicals for 2010 and 2011

Year & cases Sector	Out of 1 207 cases for 2010		Out of 1 394 cases for 2011	
	No. of cases due to exposure/contact with harmful substances & radiation	Total cases for the sector	No of cases due to exposure/contact with harmful substances & radiation	Total cases for the sector
Agriculture, Hunting & Forestry	4	221	5	238
Manufacturing	9	249	2	316
Wholesale, Retail trade, Repairs of motor vehicles & motor cycles, Personal & Household goods	2	55	0	94
Transport, Storage & Communication	1	133	0	181
Real Estate, Renting Business activities	1	34	0	51
Health & Social work	3	19	1	21
Private households with employed persons	0	5	1	7
Total	34	1090	33	1322

(c) Social implications

(i) Drugs of abuse

The problem of illicit drugs has considerably increased in the Republic of Mauritius since past few decades. Trafficking of drugs is illegal as per the Dangerous Drugs Act, which is described in the next Chapter. Accordingly, there are various types of drugs including natural and synthetic cannabinoids, psychotropic agents. It is also noted that while health authorities use Methadone therapy to alleviate the drug problem, some drug users started to developed dependency on the substance.

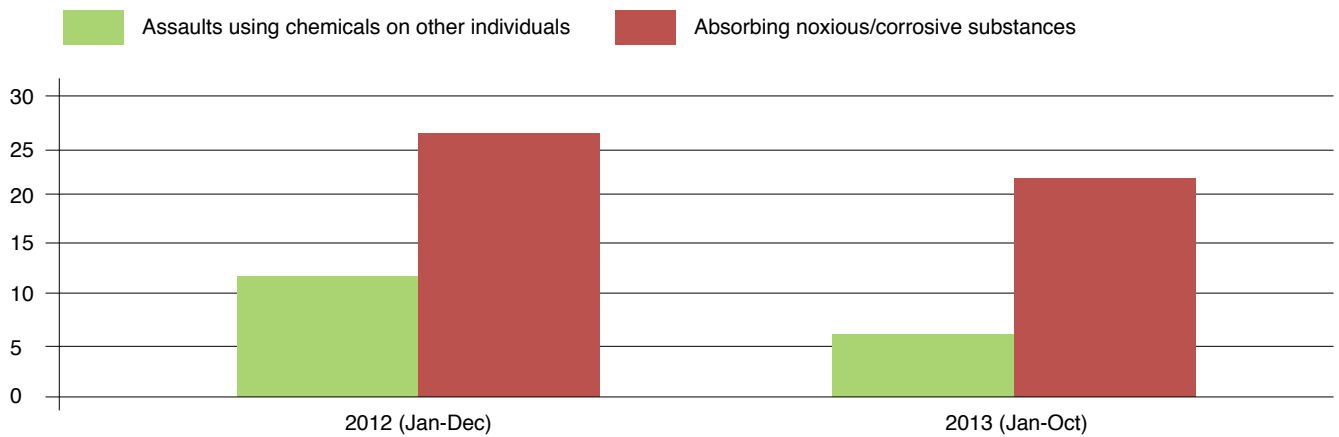
The Forensic Science Laboratory (FSL) operating under the aegis of the Prime Minister's Office, is called to conduct chemical analysis of substances of abuse following to drug seizures.

(ii) Misuse of chemicals

The easy availability of chemicals or consumer goods containing chemicals on the market is one of the main reasons for misuses like suicide attempts, acid attacks, arsons etc. In the early years of the 2000 - 2009 decade and before, suicide attempts due to chemicals were through the use of agrochemicals in liquid formulations. The eventual shift from liquid to solid formulation led to substantial reduction in these attempts from these agrochemicals. However, other types of chemicals like alcohols, thinner or petroleum products being quite easily available in retail trade are still used for such acts.

The evidence for such misuse of chemical substances can be obtained from the FSL as such misuse can be considered as a criminal act and result in police investigations. Figure 3.7 shows the number of cases of assaults using chemicals and the number of cases of absorbing noxious substances i.e. suicide attempts in Mauritius for 2012 and 2013.

Figure 3.7: Criminal acts with chemicals



(d) Other implications

(i) School attendance

In the early 2000s, some cases were reported whereby schoolchildren felt uncomfortable due to malodorous emanations within their school. In some of these cases, the children necessitated health care and had to be admitted in hospitals urgently. These situations might arise from the following:

- > Spraying of agrochemicals such as organophosphate pesticides in agricultural fields near schools.
- > Maintenance or refurbishment works such as painting of walls or application of adhesives within school infrastructure.
- > Use of cleaning chemicals such as detergents which were not well diluted before use.
- > Release of foreign substances from industrial manufacturing enterprises located near schools.

Further to previous incidents which occurred, the Ministry of Education & Human Resources issued strict guidelines on the use of chemicals as described above in school environments, for instance painting works are no more allowed during normal school hours.

(ii) Lack of knowledge

Unfortunately, not everybody is familiar with basic scientific concepts and terminologies. This lack of knowledge combined with other factors such as bad house keeping can result in accidents, a few at which are listed below:

- > People may store harmful substances in their kitchens or within the reach of young children. In some cases, dangerous substances are kept in PET bottles or other containers where by these can be easily confused with drinking water or other beverages.
- > People falling prey to incorrect or false publicity for various types of consumer goods which include cosmetics, beauty products, car polishes, grease-stripping waxes, detergents, hair dyes or even foodstuffs.

3.2 CHALLENGES TO MANAGE CHEMICALS

Although it is often suggested that safer chemical substances must be used, some dangerous chemicals do not have easily available alternatives. These may also neither be cost-effective nor compatible with the conventional technologies. Moreover, chemicals are also released in the form of pollutants, for instance as a result of manufacturing processes. Society therefore has to tackle several challenges before achieving the objective of Sound Management of Chemicals.

As Mauritius is a SIDS, most of the problem areas identified with chemical management are localised. Table 3.3 provides a description of problem areas in relation to poor chemical management within the Republic of Mauritius.

Table 3.3: Description of problem areas

Nature of problem	Region(s) affected	Brief description of problem	Chemicals/Pollutants
Lack of effluent treatment leading to water pollution	Industrial Zones	Effluents generated by manufacturing industries may contaminate nearby water bodies due to high levels of COD and of other chemical pollutants. Consequently, aquatic ecosystems are affected often lead to fish mortalities.	Organic and inorganic substances, heavy metals, spent acids /alkalis.
Water pollution due to agricultural and farming practices	Various	Run-offs from agricultural or grazing fields normally due to excessive uses of fertilisers or due to farm animal drop-outs which contaminate water bodies as they percolate from soils. This results in eutrophication (algal blooms.)	Nitrogenous fertilisers, Phosphates and other inorganic substances.
Air pollution due to illegal burning of domestic wastes	Nationwide	Burning of household solid wastes instead of proper disposal.	Undetermined but may release harmful substances like dioxins and furans.
Air pollution due to the sugar industry	Rural districts mostly	Burning cane (plants) in fields either intentionally or due to arson cause a thick brown smoke and black particles to spread within nearby inhabited regions.	Carbon and its compounds e.g. Carbon dioxide. Harmful substances like dioxins and furans,
Land, water or soil pollution due to open dumping sites	Various	Some domestic or industrial wastes which are not being sent to the Mare Chicose landfill would linger in the environment causing harm to groundwater or soil due to leaching.	Undetermined but may release harmful substances like heavy metals or organic compounds.
Air contamination in the vicinity of hospitals	Various	Medical wastes from hospitals and clinics are incinerated which cause a major nuisance to people living nearby hospitals with incinerators, hospital staff, patients & their families or passers-by.	Undetermined but may release harmful substances like dioxins and furans.
Air pollution from power generators	Various	Power plants continuously burn fossil fuels like coal and heavy oil to provide electricity but generate carbon dioxide and other waste gases.	Carbon dioxide, Sulphur dioxide, VOCs, harmful substances like mercury, dioxins and furans.
Air pollution from industries	Industrial zones	Industries which are situated near to inhabited areas have been found to release gaseous emissions affecting people in these areas.	VOCs, Carbon and carbon dioxide
Health impacts due to chemical residues in foods	Nationwide	The excessive uses of some chemicals during agricultural and farming practices may directly contaminate the food crops or livestock, whereby these have an impact on human health.	Pesticides, Fertilisers Animal/ Plant growth hormones, Antibiotics, heavy metals.
Pollution from obsolete or expired chemicals	Various	Many users of chemicals often have stocks of chemicals which turned obsolete or were expired with time. As there are no proper disposals facilities, some of these may be illegally dumped in the environment at some point in time. Consequently, soils, water bodies, air , etc. may be affected.	Undetermined but may contain hazardous substances like concentrated acids or oxidising agents.
Accidents or other undesirable events due to mismanagement of consumer chemicals	Various	Bad housekeeping of consumer chemicals can lead to accidents like poisonings, fires, food contaminations, etc. It also offers easily accessibility to people to be indulged in negative acts like 'acid attacks' or suicidal attempts.	Undetermined but can be Concentrated acids oxidising agents, flammable substances solvents, etc.

Fortunately, there have been no major chemical accidents of the scale of the Bhopal (India) tragedy or the fertiliser plant in Toulouse (France) in Mauritius. However, some undesired events did occur whereby chemicals had been the cause of harm including death. In the absence of a national chemical accident register, data has been gathered during the meetings and discussions with stakeholders for the elaboration of this NCP as well as through searches in electronic and print editions of newspapers. Table 3.4 provides a snapshot of the major events related to chemicals which have occurred in Mauritius since the year 1990.

Table 3.4: Major events related to chemicals since 1990			
Year	Description of event	Place	Effects
1991	Explosion in a building where pesticides were stored.	Flacq	One person was killed
2003	Release of chlorine gas into the atmosphere as a welder tried to manipulate with an abandoned cylinder at his own risk.	Albion	One person was killed and panic created among local inhabitants
2003	Accidental discharge of about 5 000 litres of diesel oil by a beverage factory leading to the contamination of river and riverbanks.	Rivière Seche	Removal of spilled oil necessitated few weeks.
2004	Release of noxious odours into the atmosphere emanating from <i>vinasse</i> and combustion of heavy fuel oil by a factory producing ethanol.	Rose Belle	School children had to be hospitalised. The factory eventually received a stop order and no longer exists.
2004	A collective suicide led to the death of eleven persons in a private residence.	St Paul	Forensic investigations attributed the cause of death to cyanide poisoning.
2005	Leakage of acetylene gas into the atmosphere from a factory undertaking distribution of industrial gases	Grand River North West	School children had to be hospitalised.
2005	Spillage of heavy fuel oil from a power station into an inland water body.	Canal Dayot	Removal of spilled oil was rapidly done as bad odours created discomfort to the nearby inhabitants.
2006	Storage of two tons (10 drums) of Isopropyl chloroformate at a factory that went under receivership. The chemical could have led to an explosion if its storage temperature was not maintained between -10°C to 0°C. After nearly two months, it was shipped back to its original supplier under expert supervision and the collaboration of several stakeholders.	St Pierre	The factory was cordoned off by the Police for security reasons. An enforcement notice was served by the MoHQL under the DCCA to enable safe storage conditions of the chemical on a 24-hour basis. The Government of Mauritius had to bear the entire cost which included power supply, security measures and shipment to the USA.
2007	Removal of 1.7 kg (in six glass containers) of obsolete Picric acid in a crystallised form further to a request of a chemical-testing laboratory of a para-statal institution. It was decided to dispose of the chemical by explosives in an identified area under the soils within the institution.	Réduit	The operation was undertaken by the Explosives Handling Unit, an entity of the Special Mobile Force (SMF). Access was restricted during the exercise and water was flushed by the Mauritius Fire & Rescue Services onto the grounds which bore the explosion as safety measure.
2012	Seizure of pesticides illegally stored in a private residence.	Dubreuil	Two persons fined for selling pesticides without a permit.
2012	3 000 litres of Sodium Hypochlorite found in drums caught fire in the compound of a warehouse of a sugar estate.	Deep River Beau Champ	Exact cause of fire unknown. No human casualties.

2012	Thousands of fish were found dead in water basin due to polluted waters. Exact cause of this intoxication killing the fish was unknown.	Port Louis	Abnormal levels of COD were detected in a counter analysis done at private laboratory at the request of local fishermen.
2012	Accidental drinking of diesel oil kept in a kitchen by two persons who thought it was a herbal infusion (<i>la tisane</i>)	n/a	One person died and the other survived the accident.
2012	A fire broke out in a detergent manufacturing company, whereby flammable substances were being stored. It was apparently due to a faulty electrical circuit.	Petite Rivière	Total damage was estimated at MUR 25 Million while fish in nearby water bodies were killed due to chemical contamination.
2013	Fire broke out in a container on board a cargo ship about 325 km from Mauritius. The crew was saved and the damaged ship was eventually towed to Port Louis.	Indian Ocean	Suspected to contain hazardous substances like PCBs and heavy metals, the damaged ship represented a major liability while being in the Mauritian custody.
2013	Fire broke out in a large heap of wastes at a private recycling plant which spewed a thick dusty smoke in the surrounding atmosphere for days.	La Chaumière	Complaints from local inhabitants of neighbouring villages forced authorities to serve a notice to the owner. Vegetable growers had their crops severely affected.
2013	Fire broke out in a large heap of wastes at the sanitary landfill which spewed a thick dusty smoke in the surrounding atmosphere for days.	Mare Chicose	Complaints from local inhabitants of neighbouring villages. Fire was attenuated after several days.
2013	Fire broke out in a large heap of wastes at a transfer station which spewed a thick dusty smoke in the surrounding atmosphere.	Roche Bois	Complaints from nearby local inhabitants.
2013	Intoxication of workers due to hypochlorite in a textile factory. The workers were involved in washing operations.	Goodlands	The affected workers required urgent medical attention and the factory's routine activities were disturbed.
2013	Assault on a family of five members by using an acid. A police investigation followed the assault to incriminate the culprit(s).	Plaine Verte	The five family members had to be hospitalised and the youngest one died post-hospitalisation after about three weeks.

It must be borne in mind that there could have been many other cases as shown above, but official records could not be retraced.

Table 3.5 summarises the priority concerns related to chemicals. The different descriptions of these concerns have been agreed upon by different participants at a stakeholders workshop held in December 2013.

Table 3.5: Summary of priority areas for the sound management of chemicals				
Nature of Problem	Scale of problem (regional or national)	Level of concern (low, medium or high)	Availability of statistical Data	Specific chemicals creating concerns
Air Pollution	Regional	Medium	Yes	Oxides of Sulphur and Nitrogen, Carbon dioxide, Carbon monoxide, Hydrocarbons, Formaldehyde
Pollution of inland waterways	Regional	Medium	Yes	Organic compounds Fertilisers, Inorganic compounds
Marine Pollution	Regional	High	Yes	Heavy oils

Groundwater Pollution	Regional	Medium	Yes	Nitrates, pesticides
Soil contamination	National	High	Yes	DDT & other pesticides
Chemical residues in food	National	High	Yes	Pesticides residues, Mercury & other heavy metals
Drinking water Contamination	National	Medium	Yes	Pesticides, heavy metals
Hazardous waste treatment /disposal	National	High	Yes	Dioxins, Furans, Mercury
Occupational Health – Agriculture	Regional	Medium	Yes	Pesticides
Occupational Health – Industrial	National	Medium	Yes	Lead
Public Health	National	Medium	Yes	DDT & other pesticide
Chemical Accidents – Industrial	National	Low	No	Ammonia, Chlorine
Chemical Accidents –Transport	National	Low	No	Variable
Unknown Chemical imports	National	Medium	No	Unknown
Storage/disposal of obsolete chemicals	National	High	No	Ethylene oxide (located at the port)
Chemical poisoning /suicides	National	High	Yes	Paraquat, Cyanide

3.3 CONCLUSIONS AND RECOMMENDATIONS

3.3.1 Development of Registers & Databases

As for Chapter 2 which pointed out shortcomings exist with regard to data on chemicals and the creation of proper inventories of chemicals, it is suggested that following national databases are set up:

- Records of accidents and other negative events involving chemicals at workplaces.
- Pollution cases whereby hazardous chemicals are released in the environment as effluents or waste gases especially considering that environmental pollution remains one of the biggest concerns associated with the use of chemicals so far.
- Records of cases of poisoning, suicide or any accidental events like ingestion, inhalation or assaults i.e. where chemicals have affected individuals in the society. As Mauritius is a small country, the setting up of a National Poison Control Centre may not be practicable, but proper data on these cases must be readily available from all health facilities (public and private hospitals.)

3.3.2 Studies of impacts on chemicals on the environment

More frequent monitoring of chemical pollutants must be undertaken on waters, soils, or ambient air in the vicinity where hazardous chemicals are used or stored for instance manufacturing industries using toxic heavy metal and organic compounds. It is also recommended that proper monitoring programmes for wastewaters, treated effluents, contaminated soils or gaseous emissions be set up for specific point sources leading to chemical pollution within facilities such as industrial areas, power plant producers, hotels or other types of services.

In order to limit environmental damage from substances, processes or technologies which are known to cause such damage, the use of alternatives must be studied and promoted under local conditions. Such uses, where applicable, would eventually

diminish dependencies on the hazardous chemicals or goods containing hazardous chemicals. It is recommended that incentives be introduced by Governmental authorities to encourage the shift towards safer substances or technologies. For instance, financial schemes can be developed using funding gathered through the MID Commission or other assistance through decentralized programmes from International donor-institutions for small planters, SMEs, micro-enterprises, etc. A few examples given below illustrate the type of shifts that can be applied:

- Use of compost or bio-fertilisers instead of traditional synthetic fertilisers in agricultural applications.
- Use of water-based (aqueous) solvents instead of common organic solvents in various industries.
- Use of electronic (digital) thermometers or alcohol thermometers instead of Mercury-column thermometers as practicable.

3.3.3 Studies of the impacts of chemicals on human health

Health studies due to chemicals must be conducted on a more regular basis. The few types of studies being done in this context include air monitoring in designated areas to quantify the levels of chemical contaminants and determination of blood-cholinesterase activity of agricultural sprayer men.

It is strongly recommended that more resources be devoted to conduct health studies on groups at risk such as workers handling chemicals on a routine basis, pregnant women or elderly people who may be exposed to chemicals in some specific ways such as eating habits, lifestyles, occupations, etc. These studies would be helpful to establish links between health, environment and chemicals, and can be conducted as follows:

- More frequent medical checks such as blood tests, chest X-rays or analyses of other biological specimens must be conducted on short-term basis for workers handling chemicals, or those exposed to highly dusty environments such as metallic fumes, chemical vapours, etc.
- Health assessments conducted on short-term and medium term basis for elderly or retired persons having worked in chemical related sectors or young people residing near industrial zones, etc.
- Epidemiological studies of specific cohorts at risk on long-term basis for example housewives, laboratory workers, non-smokers, etc.

It is also recommended that levels of pesticide residues in vegetables be more frequently tested by the regulatory laboratories, and in cases where MRLs are repeatedly obtained from same planters, strict actions should be taken including fines, suspension of planters' licences, etc. Such measures would discourage planters from adopting practices which endanger the health of consumers.

3.3.4 Greater consideration for Occupational Safety & Health

Given that the Occupational Safety & Health Inspectorate (OSHI) of the MoLIRE, the Occupational Health Unit (OHU) of the MoHQL and the Occupational Safety & Health Unit of the MoCSAR are entities responsible for Occupational Health, it is recommended that there be more synergy in their activities. This would be helpful in identifying workers at risks and corresponding activities as well as any patterns of workplace accidents and diseases arising due to chemicals use or exposure.

It is also important that all Occupational Health Physicians whether operating in the public system, or in private practice report all cases of workplace accidents and diseases arising due to chemicals use or exposure i.e. conforming to the Section 86 of the OSHA 2005.

It is also recommended that more professionals acquire training and specialisation in the field of occupational safety & health. Accordingly, specialised training courses can be arranged with the assistance of the Mauritius Institute of Health (MIH) on fields like Occupational Medicine and Industrial Hygiene. Considering that scholarships are awarded in Cardiology, NCD also and other areas of medicine to Medical Officers in Government service, it is further recommended that scholarships be also arranged for Occupational medicine and related fields.

3.3.5 Understanding of negative impacts of chemicals in society

It is recommended to impose more regulatory controls on selling points of toxic consumer chemicals in order to reduce possible misuse (attacks, suicide, arson, etc.).

As a result of an increased use of chemicals within the Mauritian economy, a greater number of consumer goods that are traded contain hazardous chemicals. In addition, services being offered directly or indirectly make use of hazardous chemicals. Accordingly, it is recommended that there be greater understanding of the negative impacts which some chemicals can create on life of people and to the society in general.

Greater emphasis must also be laid on proper labelling and display of warning notices on any commercial product containing hazardous chemicals as per the GHS [2]. In this respect, it is further suggested that regulations on advertising and marketing of commercial goods be reviewed so that consumers do not put their safety and health at risks unknowingly.

3.3.6 Quantification of economic impacts due to chemicals

There are no proper means to distinctively know the amounts disbursed by companies for insurance covers, insurance paid to companies after accidents and financial compensations paid to affected workers as a result of contact or exposure to chemicals. It is therefore recommended that:

- Insurance companies, through the Association of Insurers of Mauritius, provide figures on a financial year basis for such amounts disbursed specifically in this connection. This can further help in other cost analyses especially for sectors where chemicals are commonly used e.g. paint manufacturing industry or water purification services.
- The Industrial Injury Division of the MoSSRI should also provide a breakdown of the compensation paid to workers or any individuals who have faced challenges due to chemicals.

Chapter 4

LEGAL FRAMEWORK FOR THE MANAGEMENT OF CHEMICALS

The Republic of Mauritius possesses already an extensive legal framework to manage chemicals at different stages of their life cycle. The legal framework continuously evolves in order to be in line with local and global developments and international agreements.

4.1 OVERVIEW OF LEGAL INSTRUMENTS TO MANAGE CHEMICALS

The Dangerous Chemicals Control Act (DCCA) 2004, described in depth in this chapter, is the main legislation providing the backbone of chemicals management in the country. In addition, other specific legislations pertaining to different areas such as environmental quality, occupational safety & health, plant protection, food quality, control of drugs of abuse or hazardous wastes disposal support the DCCA. Although their mandates may not be exclusively about management of chemicals, these legislations are useful in developing a synergistic approach in the chemicals management process. The most relevant ones include:

- Environment Protection Act 2002
- Occupational Safety and Health Act 2005
- Dangerous Drugs Act 2001
- Ports Act 1998
- Road Traffic Act
- Pharmacy Act 1983
- Chemical Weapons Convention Act 2003
- Explosives Act 1959
- Chemical Fertilisers Control Act 1980
- Inflammable Liquids and Substances Act 1954
- Consumer Protection Act 1991
- Food Act 1998

4.1.1 Dangerous Chemicals Control Act (DCCA)

The introduction of the Dangerous Chemicals Control Act (DCCA) in the year 2004 brought a radical change with respect to legislation managing chemicals in Mauritius. Its enactment automatically repealed the entire Pesticides Control Act of 1972. This legislation did not cater for chemicals used in industrial manufacturing processes or consumer chemicals but was only concerned with agricultural chemicals, as the country previously had an agriculture-based economy. Accordingly, the DCCA can be considered as a comprehensive legislation covering a broad spectrum of chemicals.

The DCCA has been enacted to serve two main purposes namely the prevention of damage to health and environment caused by dangerous chemicals and secondly for a better protection of workers and members of the public and the environment against dangerous chemicals. For this reason, the leading institution which is entrusted to implement the Act is the Ministry responsible for the subject of health in Mauritius, currently the Ministry of Health & Quality of Life which is also responsible for other laws relevant to chemical substances namely the Dangerous Drugs Act and the Pharmacy Act. As per the DCCA, a chemical substance is defined as a chemical element, product or preparation or natural or manufactured compounds.

(a) Issue of Permits and Licenses

Any trader in Mauritius, which can be a company, private or public institution, or even an individual, may import dangerous chemicals (as defined by the DCCA 2004) provided it possesses a trade licence issued or subsequently renewed by the DCCB subject to the trader meeting official terms and conditions and payment of prescribed fees. A sum of MUR 6 000 is payable for the issue or renewal of a licence for import and export of a dangerous chemical while a sum of MUR 2 000 is payable for the issue or renewal of licence for the manufacture, sale, storage, distribution or trading of dangerous chemicals. On the other hand, for any chemical being referred to as an Extremely Dangerous chemical i.e. listed in the Second Schedule of the DCCA and for pesticides, a renewable permit is delivered by the DCCB subject to official terms and conditions and payment of a fee of MUR 200. It must be noted that the Dangerous Chemicals Control (Fees) Regulations 2005 which officially cite these prescribed fees.

Traders of chemicals are required to submit important details about themselves, the nature of their business, identity of the chemical(s), trade information pertaining to import, export and storage in an approved form (given in Annex 3) issued by the DCCB at the time of application. Moreover if a pesticide or a chemical listed in the Second Schedule is to be imported, all information must be submitted in the prescribed form (Annex 4). All official documents must be produced before the chemicals or products would actually reach Mauritius enabling the DCCB sufficient time to process these applications and eventual clearance from the Customs Department. It must be highlighted that the DCCB is also consulted for clearance of all chemicals whether listed or not in the specific Schedules.

For the trading of agricultural pesticides, excluding fertilisers, trading companies must provide all technical details to the DCCB in the form of a Registration dossier giving all relevant information as per the Application for the Registration of a pesticide shown in Annex 5. Since 2004 i.e. further to the enactment of the DCCA, 663 Registration Dossiers have been submitted to the DCCB. There is no standard format for this document, but it can be as stated below:

- Filled Application form: The trading company has to give all information requested in the Application form (Annex 5) or makes reference to other sections of the document.
- Toxicology & metabolism in mammals: In this section, technical data such as NOEL, ADI, LD50 and LC50 of the active ingredient and the formulation in rats, rabbits or other animals is given.
- Ecotoxicology & Environmental behaviour: This section also shows the above type of data but in aquatic organisms, insects, birds or other small organisms. The mode of action, residues left after application and metabolism are described in relation to the behaviour of the pesticides.
- Specifications: The chemical and physical properties of the active ingredients and formulation are shown in this part.
- Recommendations for safe use & safety information: All technical information for the uses, crops to be applied on, dilution ratios and the Pre-Harvest Intervals (PHIs) are also shown. The Safety Data Sheets of the pesticide is also enclosed therein.

- Label: The trader has to provide the product's label which would summarise all key data as well as display pictograms and warning signs for the attention of future users.

Based on the Registration dossier, the relevant Stakeholders from the Ministry of Agro-Industry and Food Security are involved in conducting trials on any specific chemical being imported for the first time into Mauritius. This is an important exercise in ascertaining that the chemical can be used in the local context considering the crop varieties on which the pesticide is intended to be used, prevalent local climatic conditions, soil characteristics, common local pests, etc. Experimentations and trials conducted on local crops for these new pesticides may take up to two years in some cases. The trade of the pesticides is only approved after successful experimentation and while the traders must meet all conditions imposed by the DCCB.

(b) Chemical substances covered

As per the DCCA, any chemical substance is classified in accordance to its Fifth Schedule in terms of physical, health and environmental hazards it represents. And as mentioned above, three important terminologies namely 'Dangerous Chemicals', 'Extremely Dangerous Chemicals' and 'Prohibited Chemicals' specify how different chemicals must be classified for trade purposes for registration purposes before licenses and permits are issued. As per the DCCA, a dangerous chemical means a chemical substance specified in the First Schedule and includes Extremely Dangerous Chemicals and any pesticides. The latter two groups of chemicals are actually listed in the Second Schedule of the Act.

There are presently 422 dangerous chemicals in the First Schedule and 164 extremely dangerous chemicals (112 agricultural chemicals and 52 industrial chemicals) in the Second Schedule while the Eighteenth Schedule has a list of 131 prohibited ones (73 agricultural chemicals and 58 industrial chemicals). It is expected that the existing lists would be further expanded to include other chemicals such as CFCs and HCFCs and newly designated POPs subject to future amendments to be made in the DCCA.

The Act has strict clauses concerning the trade, classification, labelling, marketing, transport and storage of the listed chemicals, but it also has provisions for the protection of employers and the public against the dangerous chemicals. A closer look at the chemicals in these above-mentioned schedules of the DCCA shows that most of them are organic compounds including their isomeric forms. Among the listed chemicals are also found inorganic substances, metals and heavy metals as well as their compounds. Moreover, a few of the substances listed in the First Schedule are naturally occurring ones such as the different forms of Asbestos, ceramic fibres or quartz. However, the DCCA does not apply to the following eight categories of substances:

- Pharmaceutical products (as defined in the Pharmacy Act)
- Substances as defined in the Dangerous Drugs Act
- Prepared, processed or cooked foodstuff
- Manufactured cosmetics
- Explosives as defined in the Explosives Act
- Radioactive substances as defined in the Radiation Protection Act
- Biological agents, other than biological agents used as pesticides
- A veterinary drug.

(c) Administration and Enforcement

The DCCA is administered by the Dangerous Chemicals Advisory Council (DCAC) the Dangerous Chemicals Control Board (DCCB) and an Enforcing Agencies Coordination Committee for all matters pertaining to dangerous chemicals as defined by the said Act.

Figure 4.1: Schematic representation of bodies under the DCCA

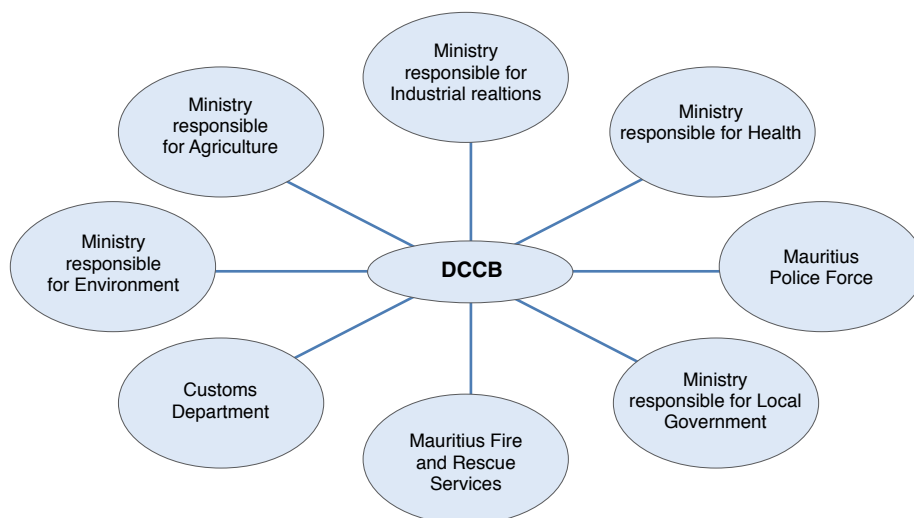


The DCAC is chaired by the Director of the Health Services of the MoHQL and comprises of 21 members from various institutions like Ministries, Governmental Departments and other undertakings, which meet officially on a quarterly basis. On the other hand, the DCCB is constituted of 16 members from various institutions some of which are called upon to serve as Enforcing Agencies as per the Act. Three technical committees which consist of DCCB members mainly, are also called convened at least once every month for matters pertaining to three specific types of chemicals.

The DCAC is called upon to advise and make recommendations to the Minister responsible for health on matters pertaining to dangerous chemicals and provide advice on the implementation of international conventions as regards these chemicals. It must also advise the DCCB on any matters pertaining to the Act. Out of the two entities, the DCCB has a much larger responsibility in the administration and enforcement of the Act. For its day-to-day running, the DCCB is manned by ‘Secretariat’ which presently forms part of the Occupational Health Unit (OHU) of the Ministry of Health & Quality of Life. As of December 2013, the DCCB Secretariat is composed of a Registrar and two Public Health & Food Safety Inspectors.

The DCCA also provides for the setting up of an Enforcing Agencies Co-ordination Committee (EACC) under the chair of the DCCB Registrar to share information, recommend to the Board such policies/measures as necessary to ensure smooth enforcement of the DCCA and to ensure proper coordination amongst Enforcing Agencies as given in Figure 4.2. The DCCA moreover makes provision for situations where no enforcing agency is specifically designated. In such situations, decisions shall be taken by the DCCB following consensus among the members. The respective compositions and functions of the DCAC and of the DCCB are described in Chapter 7, including the responsibilities of the Enforcing Agencies.

Figure 4.2: DCCB and Enforcing Agencies



4.1.2 Environment Protection Act 2002

The Ministry of Environment and Sustainable Development (MoESD) has the overall responsibility for the protection of the environment of the Republic of Mauritius. The Environment Protection Act (EPA) 2002 is the legislation through which the MoESD is mandated to ensure environmental protection in the Republic of Mauritius including its maritime zones, via the management of various environmental media like forests, soils, air surface, waters, or oceans. The latest amendment of the EPA was carried out in 2008. The EPA is buttressed by national Standards, Guidelines and Regulations enabling the MoESD as well as other Ministries and para-statal agencies to control and monitor the levels of pollutants, wastes and hazardous substances in respective media pertaining to their mandates. Another feature of the EPA is the issue of Preliminary Environment Reports (PERs) and Environmental Impact Assessments (EIA) certificates further to giving clearance for new industrial activities, including those intending to use, store or dispose of chemicals.

At national level, the MoESD has been the coordinating agency in multi-stakeholder national environmental projects such as the Mercury Assessment Programme, the Sustainable Management of Persistent Organic Pollutants (POPs) or the Integrated Coastal Zone Management (ICZM). The MoESD has also led the preparation of the long-term strategic plan for the Maurice Ile Durable (MID) concept. It is presently involved in the development of a National Hazardous Material (HazMat) Contingency Response Plan along with other stakeholders.

In terms of international environmental linkages, the MoESD is the national Focal Point of three Multilateral Environmental Agreements (MEAs) namely the Stockholm Convention on Persistent Organic Pollutants (POPs), the Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Ozone Depleting Substances (ODS).

Some of applicable Standards, Guidelines and Regulations under the EPA are:

- Environment Protection (Standards for Hazardous Wastes) Regulations 2001,
- Environment Protection (collation, storage, treatment, use and disposal of Waste oil) Regulations 2006,
- Environment Protection (Industrial Waste Audit) Regulations 2008,
- Environment Protection (Standards for Air) Regulations 1998
- Environment Protection (Drinking Water Standards) Regulations 1996,
- Environment Protection (Effluent Limitation for the Sugar Industry) Regulations 1997
- Environment Protection (Standard for Effluent for use in Irrigation) Regulations 2003
- Environment Protection (Standards for Effluent Discharge) Regulations 2003
- Environment Protection (Standards for Effluent Discharge) (Amendment) Regulations 2004
- Environment Protection (Standards for Effluent Discharge into the Ocean) Regulations 2003
- Environment Protection (Effluent Discharge Permit) Regulations 2003
- Environment Protection (Effluent Discharge Permit) (Amendment) Regulations 2004
- Guidelines for Inland Surface Water Quality 1997
- Guidelines for coastal water quality 1998
- Guidelines for irrigation water quality 1999

The MoESD has the capacity to undertake testing of several parameters concerning environmental quality as stipulated by the various Regulations and Standards under the EPA. The National Environmental Laboratory (NEL), falling under the aegis of the MOESD is an accredited laboratory to verify compliance with the EPA.

4.1.3 Occupational Safety & Health Act (OSHA) 2005

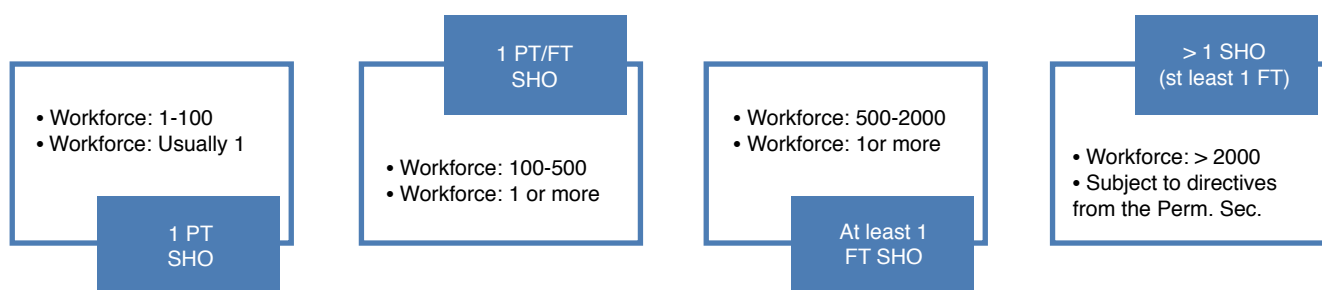
The Occupational Safety and Health Act (OSHA) has been enacted in 2005 to consolidate and widen the scope of legislation on safety, health and the welfare of employees at work. This legislation is enforced by the Ministry responsible for matters pertaining to Occupational Safety and Health in Mauritius, i.e. the Ministry of Labour, Industrial Relations and Employment

(MoLIRE). The Act is arranged in ten different sections including the General Provisions for Safety and Special Provisions for Safety & Health which are related to chemicals management. In the past few years, Regulations on noise, scaffold, and lifts were added to the Act. All employers must abide to the OSHA, irrespective of their size, status, turnover or type of business, including self-employed persons while employees include young persons, contractual employees and trainees.

The objective of the OSHA is to promote safety and health at work, several sections of this legislation describe the duties and responsibilities of employers and employees as well as importers, exhibitors or manufacturers of items used at the workplace. As per the Act, employers must undertake, record and periodically review risk assessments to identify risks to safety and health faced by their employees. The OSHA also describes the roles and qualifications needed for a person to be appointed as Safety and Health Officer (SHO) whether on full-time or part-time basis as well as duties of employers regarding the SHO. Moreover, the establishment, functions and meetings of Safety and Health Committees at workplaces with at least 50 employees are clearly described in the Act with a view to fostering employee-employer cooperation.

Figure 4.3 shows the legal requirement for SHOs with respect to the workforce for any type of employer in Mauritius. According to its Annual Reports, 770 SHOs have been registered for the period of 2003 to 2012 by the Occupational Safety & Health Inspectorate (OSHI) of the MoLIRE.

Figure 4.3: Relationship between required SHOs and workforce as per OSHA 2005



Source: OSHA 2005

Key: Full time: FT, Part-time PT

With regard to chemicals at the workplace, the OSHA prohibits young people from working with heavy metals, or being exposed to aromatic amines, benzene and other organic solvents. It also stipulates that Safety Data Sheets (SDS) must accompany the use of chemicals in order to provide regulatory, precautionary and other essential information pertaining to chemicals. Apart from keeping SDS as reference tools, employers must also display specific hazard symbols (as specified by the DCCA 2004), safety signs, notices and abstracts to provide information to workers about risks associated with chemicals being used. Moreover, as per the OSHA employers must provide appropriate infrastructure, training, protection and medical surveillance for employees' safeguards against risks associated with chemicals. This includes the use of appropriate Personal Protective Equipment (PPEs) while working with or exposed to chemicals.

As per the OSHA, chemicals are defined as elements, compounds, mixtures either natural or synthetic substances. It is observed that several chemicals including heavy metals and toxic organic compounds are listed as hazardous to health in the Ninth Schedule of the Act, thereby prohibited at workplaces, while the Fourteenth Schedule provides a list of notifiable occupational diseases, which are caused by chemical substances amongst other agents. Moreover, as per the Occupational Safety, Health and Welfare (Asbestos) Regulations 2004, raw asbestos (amphibole) must not be handled, used or stored at workplaces, while employers are required to provide to employees adequate information, instruction and training for their protection.

In case of any fatal accident or dangerous occurrence at a workplace, as per the Section 85 of the OSHA the MoLIRE must be officially informed by the employer by the quickest practicable means and must forward a report within seven days in the

form prescribed in the Thirteenth Schedule of the said Act. Such accidents or dangerous occurrences at workplaces may be involved with chemical substances. Moreover, the MoLIRE must also be notified in writing when any medical practitioner finds or suspects any person to suffer from an occupational disease as per the Section 86 of the OSHA. A list of notifiable occupational diseases has been given in the Fourteenth Schedule of the Act and includes 35 diseases caused by chemical agents, diseases caused by target organ systems and occupational cancer.

All these provisions in the OSHA demonstrate a commitment towards promulgating a chemical safety culture through employment practices in Mauritius.

4.1.4 Ports Act 1998

Most of the chemicals reaching the country and moved to outer islands are carried by maritime routes. Introduced in 1975, the legislation was subsequently amended in 1998. It describes the powers and duties of the Mauritius Ports Authority (MPA), which oversees all port activities in the Republic for e.g. unloading, handling, storage and distribution of goods, which include amongst others dangerous goods, petroleum products, and coal. The Act also describes the roles of key personnel namely Director General, Port Master and Assistant Port Masters for the smooth running of the ports. The Schedule of this Act provides a description of the physical boundaries of both Port Louis and of Port Mathurin. Compliance with international regulations and Conventions for e.g. SOLAS and MARPOL is also addressed in the legislation.

The promulgation of the Ports (Operations & Safety) Regulations in 2005 further strengthened the Ports Act. Part VIII of the Regulations describe different aspects related to dangerous goods which include chemicals for instance compliance with the IMDG Code, labelling, manifest and stowage plans, unloading and loading activities, precautionary measures etc. In Part IX and Part X, the Regulations provide similar directives for the handling of flammable liquids in bulk and for the handling of Liquefied Petroleum Gas respectively, hence these sections are directly concerned with the petroleum products which are the largest category of imported chemical substances in Mauritius. Part XI stipulates the different conditions that explosives, arms and ammunitions can be carried on ships, while Part XII dictates the responsibility of all port stakeholders towards conservancy, pollution and environmental protection. In further sections, the Regulations stipulate how stakeholders must ensure safety precautions and respond to emergencies like fires, cyclones or even sinking of ships. Consequently, through the Ports Act and these Regulations, strict conditions being applied for port activities both during the day and at night.

4.1.5 Road Traffic Act

The Road Traffic Act (RTA) first enacted in 1962 is the legislation which governs road transport in Mauritius. It covers various aspects of transportation by road such as the use of public transport, carriage of goods, vehicle registration and inspection, etc. In respect of the carriage of chemicals on public roads, the Road Traffic (Construction and Use of vehicles) Regulations 2010 of the RTA is the relevant piece of legislation for vehicles used in the transportation of the chemicals. Accordingly, specific sections of these Regulations describe in details all legal requirements for the carriage of chemicals on the roads. As per the First Schedule of the Regulations, the transportation of various types of hazardous substances must be appropriately labelled through the use of UN numbers, hazardous symbols and specific colours.

In Section 33 of the above Regulations, the requirements for the design of a tanker of flammable liquid are described including safety equipment it must be equipped with. The Section 93 stipulates that any vehicle transporting flammable substances must obtain a licence for its operation wherein the permissible volume and flammability class are mentioned. Sections 96 and 97 respectively describe the carriage of hazardous substances which include chemicals and the labelling requirements on the vehicles. Moreover, Sections 98, 99 and 100 describe the respective responsibilities of the consignor, transporter and driver for the carriage of these substances. Instructions given to drivers and his duties to report any accidents are also mentioned in these Regulations.

4.1.6 Dangerous Drugs Act 2001

The Dangerous Drugs Act (DDA) enacted in 2000 and proclaimed in 2001 is the legislation in force for the overall control of illicit substances entering or used in Mauritius. The main purpose of the DDA remains to inhibit any incorrect uses of chemical substances considered as dangerous drugs either through personal consumption or dealings. Severe penalties exist for any person committing an offence against the DDA. The Act entitles police, customs officers or Government pharmacists powers of entry to undertake searches and searches, or seizures of any substance deemed as dangerous drug further to the issue of an official warrant from a Magistrate. The legislation also describes important requirements for the sampling and conservation of such dangerous drugs for the purpose of investigations.

Several chemical substances are classified as dangerous drugs under Schedules I, II, III and IV of the legislation while its Schedule V lists preparations i.e. chemical substances at specified concentrations as dangerous drugs. However, some allowances to these Schedules specifically exist, for instance the chemical substances and preparations which are authorized for research, medical or educational purposes. Consequently, such authorizations in the form of official Licences, Import/Export Certificates are required under the DDA. Besides, these substances must be properly labelled and any legal transactions of the same must be officially recorded in prescribed registers.

4.1.7 Pharmacy Act 2004

Established under the Ministry of Health and Quality of Life, the Pharmacy Act enacted in 1985 and last revised in 2004 regulates the trade, local manufacture and quality of pharmaceutical products used and the pharmacy practice in Mauritius. By virtue of the Pharmacy Act, drugs, medicines, preparations, poisons and therapeutic substances are referred as pharmaceutical products which are mostly imported, as there are only two local manufacturing companies for pharmaceutical products in Mauritius.

Under the Pharmacy Act, all chemicals or chemical substances are listed under different Schedules. The Act requires that pharmaceutical products sold in Mauritius be in conformity with international pharmaceutical standards. The Pharmacy Act further requires that all importers and local manufacturers of pharmaceutical products have relevant operating licenses, while pharmacists must be registered with to the Pharmacy Board. Any offence made under the Act is subject to penalties in addition to suspensions or cancellations of any operating licenses.

4.1.8 Chemical Weapons Convention Act 2003

The Chemical Weapons Convention Act (CWCA) concerns specific directives in relation to chemical weapons and their precursors. The Act provides for the setting up of the Mauritius National Chemical Weapons Convention Authority, under the chair of the Prime Minister's Office, i.e. the responsible Ministry for Internal Security and Defence. The authority is also the National Focal Point of the Organisation of the Prohibition of Chemical Weapons (OPCW), an international agency of the United Nations.

By virtue of the powers of the national authority, the CWCA is aimed at prohibiting the production, procurement, use, storage, shipment, disposal of chemical weapons except in very specific cases for instance in law enforcement via the use of riot control agents. The toxic chemicals and precursors as defined under the Act include highly complex organic substances and other ones used in warfare as can be distinguished by their Chemical Abstract Service (CAS) Registry Numbers. There are 20, 14 and 17 toxic chemicals and precursors (individual ones and groups) respectively listed in the First Schedule, Second Schedule and Third Schedule of the Act. Any person having to deal with chemical substances under any of these schedules, must provide relevant information to the National Authority as prescribed, for instance during the use or preparation of such substances in laboratories.

4.1.9 Explosives Act 1959

The Explosives Act was enacted in 1959 i.e. before the Independence of Mauritius. A few sections were amended and some new ones inserted later (in 1991 and 1998). This Act regulates various activities in relation to explosives for instance their imports, manufacturing, handling, transport or storage. Accordingly, different chemical substances have been listed as explosives in the Act based on their distinct reactivities these substances can indeed exhibit explosive properties, for e.g. nitroglycerine or gunpowder. However, most explosives used in Mauritius are used in fireworks display i.e. for entertainment purposes and a lesser quantity for blasting operations such as for demolition works.

By virtue of the Explosives Act 1959, any activity mentioned above in relation to explosives officially requires a person to apply for a permit from the Commissioner of Police in Mauritius. Moreover for the storage of explosives which must always be in an approved store, an official permit is needed and finally any person using explosives is required to obtain a blasting certificate specifying the details of explosives used, the nature of works, and the location. All these requirements are subject to strict regulations by respective enforcing institutions for instance the Police Force, the Mauritius Revenue Authority, the Mauritius Ports Authority and the Ministry responsible for public infrastructure. The Act also entitles Police Officers with appropriate powers of entry for conducting searches or seizures of explosives.

4.1.10 Chemical Fertilisers Control Act 1978

The Chemical Fertilisers Control Act (CFCA) was enacted in 1980 to regulate activities related to the use of chemical fertilisers in Mauritius. It complemented at the time the Pesticide Control Act, now replaced by the Dangerous Chemicals Control Act. In a country characterized by extensive agricultural practices for more than two centuries, it was relevant to induce strict controls on the use of agrochemicals. The purpose of the Act is also strengthened by the fact that a local manufacturing company namely the Mauritius Chemical Fertilizers Industry (MCFI) started its operation since the 1980s. By virtue of the Act, the sale of any chemical fertilizers is only authorised by license holders, whereby such licenses are issued and renewed by the Ministry responsible for agriculture after payment of prescribed fees.

As per the CFCA, a chemical fertiliser is defined as a substance containing one or more basic element used as fertiliser. As per the First Schedule of the Act, the basic elements are Calcium, Magnesium, Potassium, Phosphorus, Nitrogen or Silicon. The combination of these basic elements and other chemical elements further define its overall composition which must be clearly marked on a conspicuous label on its container. Moreover, the Second Schedule of the Act stipulates by which name the fertiliser must be sold based on its composition and there are in fact 20 such trade names ranging from Ammonium Nitrate to Urea. The Act equally has provision for the analysis of fertilisers following sample collection by authorised officers of the Ministry responsible for Agriculture. A Government Analyst is then responsible to the issue of a Certificate of Analysis as stipulated in the Fourth Schedule of the Act which may be produced in Court of law in case of breach of the appropriate sections of the Act.

4.1.11 Inflammable Liquids and Substances Act 1952

The Inflammable Liquids and Substances Act is one of the oldest legislations in use in Mauritius with respect to chemical substances. It was enacted in 1952 under which the Inflammable Liquids and Substances Regulations were adopted in 1953 and eventually amended for suiting the purpose of relevant sections since then. According to the Regulations, inflammable liquids and substances have been categorised under two classes namely Class A and Class B based on their flash point, a physical property depending on temperature. For both classes of substances, strict regulations are applicable as these chemical substances have a very high risk of causing a fire or an explosion, for instance they include substances like alcohols, ethers and ketones used as laboratory or industrial chemicals as well as petroleum products used as fuels.

All inflammable liquids and substances used in the Republic of Mauritius must be imported, used, transferred, unloaded,

shipped, transported or stored as per the stipulated legislations. Certificates of registration for persons dealing with these substances as well as for facilities such as storage sites are required from the Mauritius Fire and Rescue Service (MFRS) while permits are required from the Mauritius Police Force for the transport of these substances in public roads. As per the Regulations, special markings must be displayed on all containers, vehicles, storage sites, etc. of these substances in order to draw attention towards the risks posed by them. This is indeed very important at key locations such as the airport, port areas or bulk depots whereby these substances are handled in large quantities.

Moreover, to complement the management of inflammable substances in Mauritius, two other specific pieces of legislations are present, though adopted before Independence. These are namely the Carbide of Calcium Regulations of 1967 and the Inflammable Gases Regulations of 1962. The first Regulations are meant for the industrial manufacture of Acetylene gas, widely used in soldering and other metallurgical works, from a chemical substance Calcium Carbide, a Certificate of Registration is needed for import, stockage and use. On the other hand, the second Regulations concern inflammable gases derived from petroleum e.g. LPG and associated requirements for their transportation, storage, safety warnings, etc. at specified conditions of temperature and pressure. In these cases also, Certificates of Registrations are needed from the MFRS.

4.1.12 Consumer Protection Act 1991

The Consumer Protection Act (CPA) of 1991 is specifically devised to inform about the rights of consumers in relation to all consumer goods put on sale whether locally produced or imported and it is enforced by the Ministry responsible for the subject of Consumer Protection. The Act defines substances as any natural or artificial substance, whether in solid, liquid or gaseous form or in the form of a vapour and includes substances that are comprised in or mixed with other goods. As per this definition, chemical substances are concerned, as they are always present in different proportions in any material objects or entities considered as goods and traded.

According to the CPA 1991, no person is authorised to supply goods having any faults in respect of their quality, quantity, purity or standard as prescribed except for specified items like food, medicines or fertilizers as they are regulated by their own specific legislations. This is highly important as consumers are expected to read and check information on the product labels or packaging container before purchasing or accepting any goods. In the specific case of chemical substances used as ingredients in consumer goods such as detergents or cosmetics, these ingredients must be clearly marked in English or French Language for the consumers' notice. Moreover, under the Act, different Regulations have been made concerning price control, price labeling, and maximum mark-up of consumer goods as enforcement means by the relevant Ministry.

4.1.13 Food Act 1998

The Food Act 1998 which includes the Food Regulations of 1999 is the legislation which governs the quality of food and drinks which are consumed in Mauritius. The Regulations comprise of 31 different Parts covering 64 Schedules are applicable for all sorts of foods and drinks whether locally manufactured or imported from various parts of the world. Accordingly, the said Regulations stipulate that all pre-packed food items, both cooked and uncooked, must have a manufacturing date, expiry date, lot identification and a net weight or net volume, clearly displayed in either English or French on its container or pack. It is mandatory to verify the compliance of the food and drinks by means of physical, chemical, or microbiological analysis with the relevant schedules of the Food Regulations. Only items that meet all criteria following appropriate physical examination and laboratory analysis of their samples are given a pre-market approval, otherwise their sale would not be permitted as per the Food Act.

Specific Schedules of the Food Regulations 1999 require that the chemical composition of food and drinks be ascertained by analysis since their ingredients include chemicals substances used as colouring agents, preservatives, artificial flavours, conditioners, stabilizers or other food additives. Though present in minute quantities, these chemicals are either subject to maximum permissible limits or are not permissible. Moreover, the Seventh Schedule (regulation 62 (2) (a)) lists the Maximum Permitted proportion of metal contaminant in ppm in specified foods, there are 10 such metal contaminants including

Cadmium and Mercury. On the other hand, the Tenth Schedule (regulation 62 (2) (d)) gives the maximum pesticide concentration in ppm in various types of foods, there are 74 such pesticides including some banned ones like Heptachlor and Chloropyrifos. Finally, the Guidelines for Bottled water give a list of acceptable substances in the drinking water, these substances include heavy metals, pesticides which must not be beyond maximum limits which are derived from the World Health Organisation (WHO) Standards.

The Food Act provides authorized public officers with powers of entry for conducting inspections of food businesses and for collecting food samples in a prescribed manner for consequent laboratory analysis by a Government Analyst or food microbiologist. The Act also empowers officers to issue official an Improving notice, a Prohibition Order or an Emergency closing order to any offenders depending on the extent of the breach. In cases of offences, the food items may be seized or removed from the market while entire batches or consignments are eventually destroyed if these or their samples are found to be unfit for human consumption. The food samples which are analysed are subject to officially prescribed fees as per the sixth Schedule of the Act. These results may not be used for any publicity for the food during its sale.

4.2 SUMMARY OF KEY LEGAL INSTRUMENTS TO MANAGE CHEMICALS

Further to descriptions of all key legislations in place for managing chemicals in the previous section, a summary of some of

Table 4.1: References to existing legal instruments for the management of chemicals						
Legal instrument	Responsible Ministry	Chemical categories covered	Objective of legislation	Relevant articles /provisions	Resources Allocated	Enforcement ranking
DCCA	MoHQL	<ul style="list-style-type: none"> • Agricultural Chemicals • Industrial Chemicals • Consumer Chemicals 	Prevent damage caused by dangerous chemicals and to ensure a better protection against these.	<ul style="list-style-type: none"> • First Schedule • Second Schedule • Eighteenth Schedule 	Highly Inadequate. Lack of appropriate staff for proper implementation	High
EPA	MoESD	<ul style="list-style-type: none"> • Heavy-metals • Inorganic • Organic • POPs • CFCs • HCFCs 	Protect the environment and ensure Sustainable Development	Regulations list the Maximum Permissible Limits of chemicals as pollutants.	Well-staffed and equipped with a laboratory. Testing facilities available.	Very high
OSHA	MoLIRE	Various types	Ensure safety and health of people at work	Some Schedules are related to chemicals used in working environments	Inadequate. No testing facilities	High
DDA	MoHQL	Substances used as illicit drugs	Ensure that drugs including synthetic ones are being correctly used.	Some Schedules are related to chemicals substances used as drugs	Inadequate. No testing facilities	High
Food Act	MoHQL	Various types including residues of pesticides or other contaminants	Ensure that foods and drinks are fit for human consumption and are thus free from contaminants	Schedules list the Maximum Permissible Limits of chemicals which are permitted in foods, drinks and bottled water.	Well-staffed and equipped with a laboratory. Testing facilities available.	Very high

4.3 RESTRICTED CHEMICALS

Legislation in force in Mauritius to manage chemicals at different stages of their life cycle contains specific sections pertaining to restrictions on chemicals. Table 4.2 provides an overview thereof.

Table 4.2: Applicable restrictions in legislations on chemicals				
Legislation	Type of chemicals	Number of chemicals listed	Restriction level of chemicals	Details
DCCA (Second Schedule)	Extremely Dangerous Chemicals & Pesticides	164 + Any pesticide	Severely restricted	A permit is needed to import, distribute, sale, store these chemicals.
DCCA (Eighteenth Schedule)	Prohibited chemicals including POPs	131	Banned	An official authorisation needed to import, use, manufacture or possess these chemicals.
OSHA (Nineth Schedule)	Various substances hazardous to health	34	Banned for workers	Any worker must not be exposed to such substances as officially directed by a medical practioner following health surveillance.
DDA (Schedule I)	Chemical substances and preparations	69	Severely restricted	Allowed only for scientific, research and forensic purposes.
DDA (Schedule II)	Chemical substances and preparations	90	Severely restricted	A licence is needed for any official use of these chemicals.
DDA (Schedule III)	Chemical substances and preparations	70	Severely restricted	A licence is needed for any official use of these chemicals.
DDA (Schedule IV)	Chemical substances used as precursors	23	Severely restricted	A licence and an import authorisation are needed for the official use of these chemicals. Restriction is as per the Opium Convention.
DDA (Schedule V)	Preparations of chemical substances	7	Severely restricted	Strict conditions on the composition of these preparations are applicable.

4.4 CONCLUSIONS AND RECOMMENDATIONS

4.4.1 Review and update of key legislation

The DCCA is a comprehensive legislation on chemical management in Mauritius. It describes important aspects of the life cycle of chemicals such as imports, exports, transport, use or storage. However, the Act must be revised as it is almost ten years old and new issues in chemicals management have emerged since the past few years for e.g. new challenges to human health and environment like use of chemicals based on nanotechnology, new POPs or endocrine-disrupting chemicals elucidated after thorough scientific evidence.

As described in Section 4.1.1, the registration of an agricultural pesticide involves a systematic process, whereby emphasis is laid on the active ingredient mentioned in its Registration Dossier, while its solvent medium has lesser importance. Accordingly, once the agricultural pesticide is registered under the DCCA, its solvent medium may be subject to changes at the time of future imports of the said product although the active ingredient remains unchanged. It is recommended that no modifications be brought in the ingredient list of any registered agricultural pesticide by local traders since new solvent mediums can contain harmful chemicals or may hamper the efficacy of the product in controlling pests.

The duty to provide information to all concerned parties for e.g. workers, law enforcers, industrialists or to the public is reflected through the relevant sections of the DCCA describing the classification, labelling and marketing of chemicals. However, this is not always done in practice and, it is recommended that there be more information available concerning the various aspects of the DCCA through via broadcasting, print or electronic media to enable proper dissemination to all relevant parties.

Despite the existence of various legislation to manage chemicals in Mauritius, adequate enforcement is not always being carried out. The main reason behind this situation is the lack of appropriate and adequate resources allocated to the relevant regulatory authorities although some sections of these legislations can be complex to implement. Accordingly, it is recommended that a proper needs analysis be conducted to identify additional resources that should be made available for a more effective enforcement of legislations. Further details on resources to manage chemicals are given in Chapter 11.

It is noted that a few key Ministries and parastatal bodies which are enforcing agencies to manage chemicals in Mauritius, do not have adequate regulations or standards for them to exert their regulatory roles. It is recommended that cases of mismatch be corrected through the appropriate amendments to regulations. The most common examples in this context are as follows:

- The Ministry of Local Government & Outer Islands is the enforcing agency for the management of hazardous wastes as per the Hazardous Wastes Regulations 2001 and Industrial Waste Regulations 2008, both enacted under the Environmental Protection Act which principally concerns the Ministry of Environment & Sustainable Development.
- The Food Technology Laboratory/Agricultural Chemistry Division of the Ministry of Agro-Industry and Food Security conduct testing of chemical parameters in locally produced foods (unprocessed) to monitor compliance with the Food Act 1998 passed under the Ministry of Health & Quality of Life.
- Two para-statal bodies namely the Central Water Authority and the Wastewater Management Authority, both having their own legislations, conduct testing of chemical parameters pertaining to water quality to monitor compliance with Environmental Protection Act passed by the Ministry of Environment and Sustainable Development.

4.4.2 Greater emphasis on Consumer protection

An adequate mechanism must be set up for the protection of consumers against goods containing harmful chemical substances. It is recommended that the Consumer Protection Act be strengthened for issues pertaining to labelling, chemical composition, warning information, etc. for the benefit of consumers. In order to discourage individuals or other groups from misusing chemicals, it is recommended that relevant legislation be amended for better control by enforcing authorities. For example:

- Sale of chemicals may be restricted to some types of retail outlets, whereby these must apply for official permits to undertake the sale of these chemicals.
- Product labels must display all appropriate safety information to the attention of consumers for all chemicals put on sale.
- Regular inspections and checks at point of sales of chemicals, especially those for which there are little control for instance thinners and other organic solvents.
- Education and awareness campaigns within the population on the sales of chemicals.

4.4.3 Strengthened Regulatory framework

It is recommended that the relevant laws be amended in line with the development of the country to cater for evolving possibilities of fatal accidents, misuse or other undesired events. Examples of such activities are as follows:

- Sale and storage of flammable substances like thinners, 'test benzene' and other organic solvents in retail trade such as in shops, supermarkets, etc.
- Sale and display of fireworks practically anywhere during end of year or other major festivities.
- Use of pressurised gas cylinders (which may be inside public buildings) for inflating recreational balloons and application of face & body painting on young children i.e. entertainment activities.
- Display and storage of incompatible consumer goods near to one another in supermarkets or other retail outlets, for instance matchboxes and flammable substances like denatured alcohols or organic solvents being kept for sale.
- Private tuitions for conducting Chemistry practical classes inside houses or rented office buildings, etc., whereby chemicals stored can cause harm to neighbouring people if not properly disposed of or due to bad house-keeping.

Chapter 5

GOVERNMENTAL INSTITUTIONS FOR THE MANAGEMENT OF CHEMICALS

Governmental institutions are called upon to collaborate through knowledge transfer and information sharing processes. They are often involved in national committees, commissions or other fora to manage chemicals at different stages of their life cycle. It is only by bringing concerted efforts that the various institutions succeed in such endeavours, however diverse their official mandates may be. Moreover, institutions play determining roles whenever their governments devise national policies, participate in regional mechanisms, or adhere to international agreements on the sound chemical management. Furthermore, specific governmental institutions are entrusted to serve as national focal points for international agreements implemented to manage chemicals, e.g. the Multilateral Environment Agreements (MEAs).

5.1 RESPONSIBILITIES OF MINISTRIES AND OTHER GOVERNMENTAL INSTITUTIONS TO MANAGE CHEMICALS

This Chapter depicts the roles of the existing Governmental institutions in Mauritius in respect of the Sound Management of Chemicals. Table 5.1 shows the present list of Ministries as of December 2013 in alphabetical order.

Table 5.1: Composition of the Central Government, Republic of Mauritius		
Ministry	Acronym	Number of staff
Ministry of Agro-Industry & Food Security	MoAIFS	2 802
Ministry of Arts & Culture	MoAC	250
Ministry of Business Enterprise & Cooperatives	MoBEC	195
Ministry of Civil Service & Administrative Reforms	MoCSAR	560
Ministry of Education & Human Resources	MoEHR	11 371
Ministry of Energy & Public Utilities	MoEPU	383
Ministry of Environment & Sustainable Development	MoESD	767
Ministry of Finance & Economic Development	MoFED	1 328
Ministry of Fisheries	MoF	396
Ministry of Foreign Affairs, Regional Integration & International Trade	MoFARIIT	333
Ministry of Gender Equality, Child Development & Family Welfare	MoGECDFW	256
Ministry of Health & Quality of Life	MoHQL	12 309
Ministry of Housing & Lands	MoHL	418
Ministry of Home Affairs, External Communications and Rodrigues (Under the Prime Minister's Office)	PMO	Please see below
Ministry of Industry, Commerce & Consumer Protection	MoICCP	256
Ministry of Information & Communication Technology	MoICT	289
Ministry of Justice (Attorney General's Office)	AGO	688
Ministry of Labour, Industrial Relations & Employment	MoLIRE	523

Ministry of Local Government & Outer Islands	MoLGOI	1 389
Ministry of Public Infrastructure, Land Transport, Shipping & National Development Unit	MPI	1 656
Ministry of Social Integration & Economic Empowerment	MoSIEE	24
Ministry of Social Security, National Solidarity & Reform Institutions	MoSSNSRI	1 166
Ministry of Tertiary Education, Science, Research & Technology	MoTESRT	35
Ministry of Tourism & Leisure	MoTL	71
Ministry of Youth & Sports	MoYS	403
Prime Minister's Office	PMO	14 415

The Ministries listed above including relevant departments as well as parastatal bodies which are involved in the management of chemicals in Mauritius are further described in this section. Being the national focal point for the Strategic Approach on the International Chemicals Management (SAICM), the Ministry of Health and Quality of Life is described first.

5.1.1 Ministry of Health and Quality of Life (MoHQL)

The Ministry of Health and Quality of Life (MoHQL) is responsible for providing health services in Mauritius, Rodrigues and Outer Islands. It is one of the largest Ministries in terms of staff and other resources needed to offer such services which are free of charge, but is also one of the oldest Ministries as it already existed in the pre-independence era. The main role of the MoHQL within all territories of the Republic of Mauritius is to develop a comprehensive health service system aiming to treat, prevent and reduce diseases as well as health conditions. It must also respond to all emergency services whereby victims from accidents (households, workplace or transport), burns, poisonings, suicides, etc. are brought at its facilities.

The Government of Mauritius devotes a large share of the national budget to the MoHQL, the latest figure being 8.5 billion MUR while its revenues are only about 50 million MUR. The Ministry has to manage all governmental medical facilities like regional and district hospitals, Area Health Centres, Community Health Centres, Mediclinics, dental clinics, laboratories, Health Offices, etc. All these facilities are grouped on a regional basis whereby a Regional Health Director (RHD) is appointed to oversee their functioning. Some of these facilities comprise of high-tech medical equipment like Magnetic Resonance Imaging (MRI) or Computerised Tomography (CT) scanning devices, etc.

The MoHQL is also called upon to implement different types of programmes and preventive campaigns on various health related areas such as healthy nutrition, anti-tobacco campaigns, physical fitness, family planning, maternal and child health, rehabilitation of drug addicts, blood donations, etc. which are often good means of sensitization for people to adopt a healthy lifestyle. In order to keep records of its services, annual reports on health statistics are yearly published by the MoHQL since 1975. This yearly report is now available on the website of the MoHQL.

5.1.2 Dangerous Chemicals Control Board

As regards chemicals management in Mauritius, the MoHQL is one of the main public institutions in this field since past few decades thereby protecting the environment and human health against the harmful effects of chemicals. It is the leading enforcing agency of the Dangerous Chemicals Control Board (DCCB) since 2004. The DCCB which functions as required by the DCCA has a mini 'Secretariat' to manage its day-to-day running, for instance, matters pertaining to the registration, licensing and clearance of chemicals. As seen through the earlier Chapters, chemicals imported into Mauritius require licence holders to obtain trade permits from the DCCB depending on the Schedules wherein the chemicals are listed as per the DCCA in addition to granting clearance for imports of the chemicals as applicable.

By considering only three main categories of chemicals namely Agricultural chemicals, Consumer chemicals and Industrial chemicals, the respective number of trade permits issued and clearances given in 2012 and 2013 by the DCCB are shown in Figures 5.1 and 5.2.

Figure 5.1: Trade Permits and Clearances issued for Chemicals in 2012

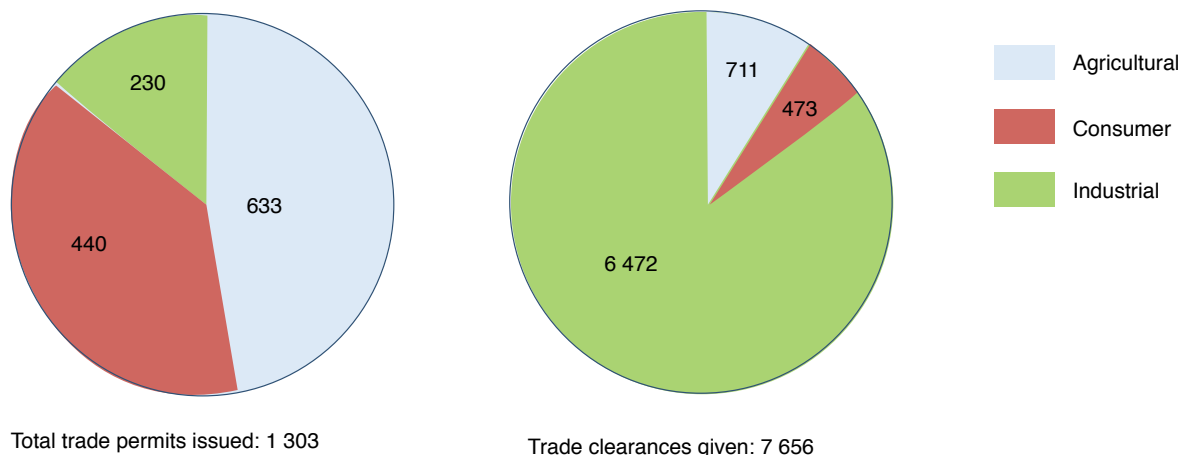
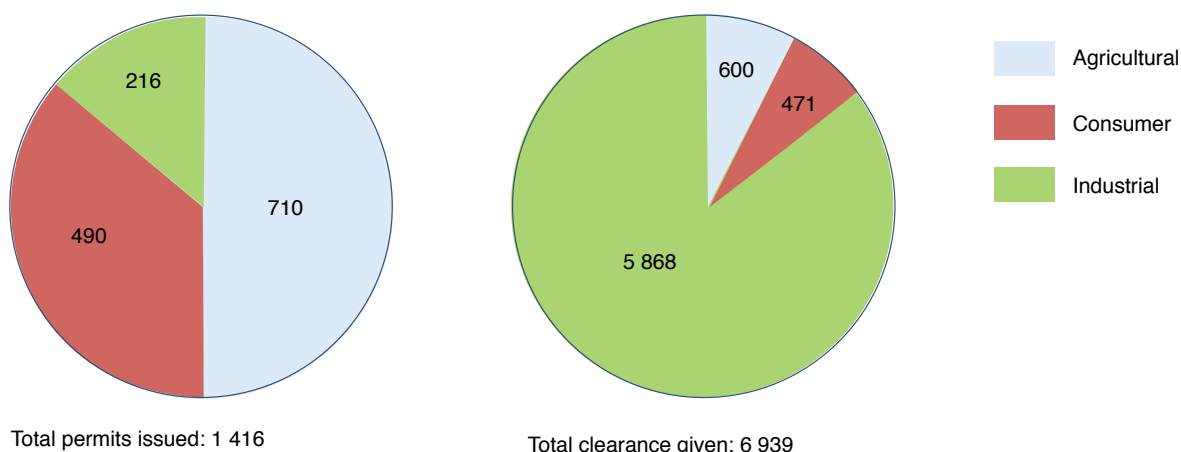


Figure 5.2: Trade Permits and Clearances issued for Chemicals in 2013



From the above figures for both years, most trade permits were issued for agricultural chemicals while almost 85 % of the clearances were issued for industrial chemicals. As mentioned in Chapter 2, many chemicals not listed in the DCCA 2004 still require clearance from the DCCB which accounted for the high figures for the industrial chemicals. The DCCB is involved on a routine basis in processing all paper work and site visits associated with the licenses, permits and clearances as applicable.

5.1.3 Occupational Health Unit

Since its inception, the DCCB has been attached to the Occupational Health Unit (OHU) which was itself created in the late 1980s with a small team of Occupational Health Physicians (OHPs). Among the first cases which these doctors had to intervene was the case of lead poisoning due to manufacturing of car batteries in Mauritius. As of December 2013, the MoHQL has only six OHPs serving nine Occupational Health Clinics and other health facilities throughout the Republic of Mauritius. In 2011, the number of workers diagnosed with Work Related Diseases (WRDs) and Occupational Diseases (ODs) by the OHU during screening sessions are given in Table 5.2 below.

Table 5.2: Occupational Diseases and Work Related Diseases in 2011

¹ Condition	Male worker	Female worker	Total
Diseases caused by chemical agents	5	1	6
Diseases caused by physical agents	2	0	2
Diseases caused by biological agents	8	1	9
Occupational respiratory diseases	16	5	21
Occupational skin diseases	18	4	22
Occupational musculo-skeletal diseases	93	19	112
Occupational Cancer	0	0	0
Other diseases	4	3	7
Total	146	33	179

Source : Health Statistics Report 2011, MoHQL

¹ As per ILO's list of occupational diseases

In terms of international linkages concerning chemical management, the Ministry is the Designated National Authority for the Rotterdam Convention on Prior Informed Consent, which promotes international cooperation for the safe trade of certain hazardous chemicals while the Head of the OHU is the national focal point of the Strategic Approach for International Chemical Management (SAICM), multilateral international policy framework set up to manage chemicals.

Figure 5.3: Organigram of the Occupational Health Unit

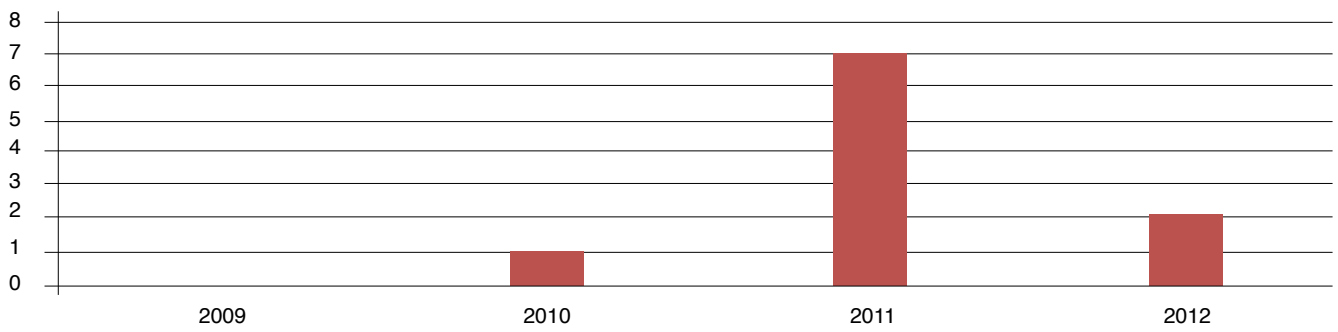
The MoHQL also comprises other important departments and Boards such as the National Blood Transfusion Service, the Medical Board, the Pharmacy Board, the Non-Communicable Diseases (NCD) & Health Promotion Division, Environmental Health Engineering Unit, the Vector Biology Control Division and the Government Analyst Division. A few relevant ones are described below.

5.1.4 Government Analyst Division (GAD)

The Government Analyst Division (GAD) is an analytical section of the Ministry which mainly grants official sanitary clearance for local and imported foods and drinks prior to their sale on the local market. It is a specialized unit of the MoHQL where laboratory testing is conducted to ensure that the food and drinks are fit for human consumption as stipulated in the Food Act of 1998 and the Food Regulations of 1999. It is mandatory to verify the compliance of food and drinks by means of physical, chemical, or microbiological analysis with the schedules of the Food Regulations of 1999. Only items that meet all criteria following analysis of their samples at the GAD are given a pre-market approval, otherwise their sale would not be permitted, thereby constituting an offence against the Food Act.

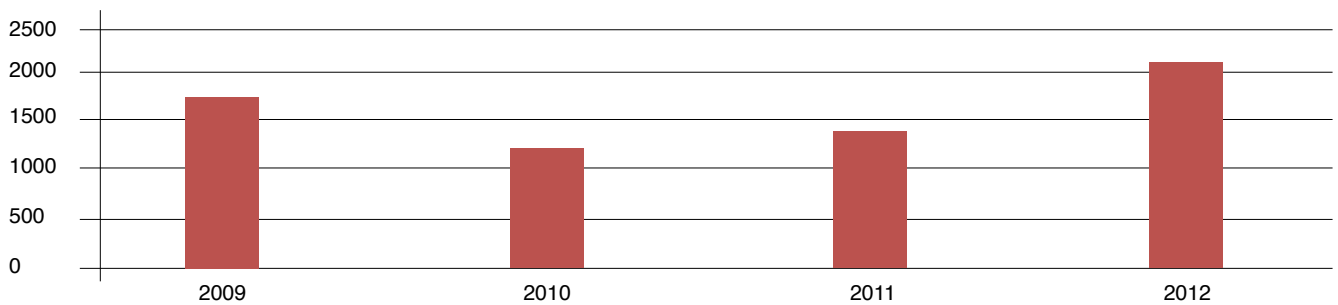
Moreover, the GAD also intervenes in cases of food poisoning and food adulteration for instance when food on sale is contaminated by chemical substances or microorganisms. Through its toxicological section, it regularly conducts tests for cholinesterase activity on blood samples from hospital patients and workers especially sprayer men. It also conducts tests for poisoning cases due to suicidal attempts or accidental ingestions. Figures 5.5 and 5.6 provide an indication of the respective number of tests for blood-cholinesterase activity and on cases of Paraquat poisoning detected at the GAD. It must be noted that in the past, the herbicide Paraquat was a major source of worry with 50 – 60 cases annually due to misuses. Accordingly, it faced a temporary ban, but it has been re-allowed on a controlled basis annually i.e. a specific volume is allocated per planter.

Figure 5.4: Number of tests for Blood Cholinesterase activity



Source: GAD, MoHQL July 2013

Figure 5.5: Number of cases of Paraquat/Gramoxone detected



Source: GAD, MoHQL July 2013

5.1.5 Public Health and Food Safety Inspectorate

The Public Health and Food Safety Inspectorate (PHFSI) is a department which is responsible for inspecting food outlets and businesses where food is being prepared to ensure that sanitary norms are being respected as per the Food Act. The Public Health Officers are empowered to purchase or collect food samples for testing the fitness for human consumption at the Government Analyst Division (GAD).

5.1.6 Communicable Diseases Control Unit (CDCU)

The Communicable Diseases Control Unit (CDCU) is responsible for ensuring a good state of public health by coordinating activities pertaining to outbreaks vector-borne and other communicable diseases. The CDCU staff are trained as per WHO guidelines being called upon to conduct spraying, larviciding and fogging activities in public places both on a routine basis or during any major outbreaks of vector-borne diseases, the last one being in 2008 (Chikungunya outbreak.) For this very reason, a stock of DDT is stored as a precautionary measure for indoor spraying in case of any malarial outbreaks. Being a tropical island, Mauritius had known several outbreaks of Malaria which threatened the human population due to high prevalence rates in the last century.

The CDCU collaborates with other sections of the MoHQL like the Vector Control Biology Division and the Environmental Health Unit for its work. It must also be noted that the cabin crew of all aircrafts departing from Mauritius are required to spray the inside of the plane with insecticides approved by the MoHQL. On the other hand, incoming passengers are screened at the port and airport especially from countries witnessing outbreaks of communicable diseases like Avian flu or SARS. The CDCU ensures the procurement of the pesticides and all related equipment including PPE. Table 5.3 below shows the quantities of pesticides in stock as at August 2013 by the CDCU.

Table 5.3: Stock of pesticides for public health available at CDCU

Pesticide	¹ Quantity in stock	Remarks
Temephos 50 EC	420 litres	Donated by the WHO on a bi-annual basis (600 litres / 2 year)
Deltamethrin	220	Currently used
Alpha-cypermethrin	127	Not used since past 3 years
Lambda-cypermethrin	25	Currently used
² DDT	5 000 kg	Donated by the WHO since several years

Source: CDCU, MoHQL August 2013

¹ As at August 2013

² Currently stored at Pamplémousses (SSRNH)

5.1.7 Pharmacy Board

All pharmaceutical products in use in Mauritius must be duly registered with the Pharmacy Board to prevent any malpractices by pharmacies or the public. The Pharmacy Board is also represented in the DCCB. Moreover, a National Pharmacovigilance Committee has also been set up under the MoHQL and is responsible for collecting and analysing data on any adverse drug reactions in relation to the prescription and use of drugs in the treatment and control of disease. A few medicines have already been prohibited from all points of sale further to the decision of the Committee.

5.1.8 Prime Minister's Office (PMO)

The Prime Minister's Office is responsible for all matters pertaining to Defence, Home Affairs, External Communications in Mauritius. In order to achieve its various roles, it has several functional units and departments e.g. the Mauritius Police Force, the Forensic Science Laboratory, or the Mauritius Oceanography Institute. Although, these entities have different mandates, some of them are involved in the sound management of chemicals through specific responsibilities. Moreover, in 2008, the PMO launched a long term project entitled Maurice Ile Durable (Mauritius - Sustainable Island) which is now being managed by the MID Commission. The following sections describe the relevant bodies falling under the PMO and which are concerned with Chemicals Management.

(a) Maurice Ile Durable Commission

The Maurice Ile Durable (Mauritius, a Sustainable Island) Commission is responsible for the implementation Maurice Ile Durable Policy, Strategy and Action Plan which is the overarching framework for sustainable development in Mauritius. The Action plan covers four main priority programmes namely energy conservation and renewables; cleaner, greener and pollution free Mauritius; green economy; and ocean economy. Given its mandate and all-encompassing activities, the MID Commission works in close collaboration with key government players and ought to be a vital stakeholder for the proper implementation of SMC activities and its mainstreaming at all levels.

(b) Mauritius Police Force

The Mauritius Police Force (MPF) is primarily responsible for maintaining the respect of law and order within the Republic of Mauritius. It comprises of different sections and specialised units for this purpose whereby members of the Force require different types of training for conducting their duties. It is involved in various activities like law enforcement, criminal investigations, road traffic management, control of illicit drugs, rescue operations, etc. As regards chemicals management, the MPF is responsible for the management and arrangements for the transport of dangerous chemicals by road as well as training drivers. These responsibilities make the MPF an important enforcing agency under the DCCB.

The Special Mobile Force (SMF) is an important unit within the MPF, consisting of a specialised entity responsible for handling explosives and responds to any bomb alerts. Its officers have received appropriate training in this field of expertise. One

of the most recent departments of the MPF is the Counter Terrorism Unit, created in 2012 to address any matters related to terrorism and national security.

(c) Forensic Science Laboratory (FSL)

The Forensic Science Laboratory (FSL) is responsible to analyse specimens collected by officers of the MPF such as the Scene of Crime Officers (SOCO), Anti-Drug and Smuggling Unit (ADSU), etc. during the course of a police investigation. The FSL works in close collaboration with the MPF and provides its expertise in analysing suspected samples of drugs or other chemical substances. Its technical capabilities are mentioned in Chapter 9.

5.1.9 Ministry of Energy & Public Utilities

The Ministry of Energy & Public Utilities (MEPU) is responsible for matters on energy, radiation, water and wastewater in Mauritius. It called upon to provide the right framework and assistance for the creation of national policies related to these areas. The MEPU must also ensure that efficient services are provided by the para-statal organisations falling under its purview although they are operated by their own management and Boards. It must be noted that some of these institutions are in fact revenue generating for the central government for instance, consumers or end-users must pay fees for electricity and water consumption as well as for wastewater generation. These institutions are the Central Electricity Board (CEB), the Central Water Authority (CWA), the Wastewater Management Authority (WMA), the Water Resources Unit (WRU), the Energy Services Division (ESD) and the Radiation Protection Authority (RPA).

(a) Central Water Authority (CWA)

The Central Water Authority (CWA) is responsible for the overall distribution of water in Mauritius since the past 40 years. There are presently 10 reservoirs including a dam in Mauritius. Following precipitation and evapotranspiration, an approximate volume of 3 000 Mm³ is annually available for consumption. This water must be treated before domestic use and the CWA employs Chlorine gas to sterilize it at its treatment stations. As the CWA has to ensure that water of good quality actually reaches all consumers, it is equipped with two analytical sections to conduct testing on water samples collected from various points. Several parameters are routinely tested against the Standards for Drinking Water under the EPA. More details on the technical capacities of the CWA laboratory are given in Chapters 9 and 11. In addition, the CWA is involved in the chemical management at national level due to its representation in the Advisory Council of the DCCA.

(b) Wastewater Management Authority

The Wastewater Management Authority (WMA) is responsible for sanitation and the sewerage network in Mauritius since 2001. It is specifically involved in the treatment of wastewaters and in the overall management of the public sewer network including wastewater treatment plants to protect the environment in Mauritius. It issues licenses to industries and hotels for disposing their treated effluents into the sewer network and to private operators for the carting away of wastewater to treatment plants. For this treatment, the WMA employs chemical substances like Iron and Aluminium compounds to remove pollutants during one of the processes involved, and Chlorine to sterilize the treated effluents before their release. The WMA is also equipped with an analytical laboratory whereby water samples are routinely analysed to determine level of pollutants in the wastewater as well as in the treated effluents. More details on the technical capacities of the WMA laboratory are given in Chapters 9 and 11. It also participated in national projects whereby environmental and chemical management are concerned.

(c) Radiation Protection Authority (RPA)

The Radiation Protection Authority (RPA) is the enforcing agency for the protection against radiation in Mauritius. It is administered by a Radiation Protection Council (RPC) which comprises of members from various Ministries and organisation.

It provides regulatory control on all items imported, handled or used which emits radiation such radiological equipment for medical facilities or testing equipment. The RPA provides Radiation Protection Monitoring Service for all workers exposed to ionizing radiation since July 2012.

5.1.10 Ministry of Finance and Economic Development (MoFED)

The Customs Department (CD) of the Mauritius Revenue Authority operating under the aegis of the Ministry of Finance and Economic Development (MoFED) is also a key institution involved in SMC in Mauritius. As mentioned earlier, all chemicals being used in all the Mauritian territories are imported and not locally produced. Hence, all chemicals whatever their quantities, origins, types, monetary values or intended uses have to be declared at the Customs Department which has adopted the Harmonised System of classification of the World Customs Organisations (WCO) to classify all imports i.e. including chemical imports. This department is in close contact with the Dangerous Chemicals Control Board (DCCB) to issue any clearance or permit for chemical substances classified under the respective Schedules of the DCCA and all importers must be duly registered under the said Act. The CD may also conduct inspections at the facilities of the traders in chemicals if needed and is represented in the Advisory Council of the DCCB.

The CD is currently developing a new electronic system under a single window constituting a one-stop shop for all traded goods. This computerised system named TradeNet will link the CD and local enforcing agencies i.e. Ministries and institutions falling under them such as the DCCB, National Plant Protection Office, Radiation Protection Authority or the Consumer Protection Unit over a common platform. Once fully implemented, these stakeholders will be in a better position to impose regulatory controls on the items falling under their purview before clearance. Accordingly, for all chemical imports into Mauritius, the DCCB, in its capacity of enforcing agency, will be called upon to justify that clearance can be given for all chemicals or chemical-containing products after processing the applications.

5.1.11 Ministry of Public Infrastructure, Land Transport and Shipping

The Ministry of Public Infrastructure, Land Transport and Shipping (MPILTS) is responsible for matters related to the building and maintenance of public infrastructure like roads, bridges, drains, as well as matters pertaining to road transport and shipping. Among its para-statal bodies, the ones which are more relevant to management of chemicals are described below.

(a) Mauritius Ports Authority

The Mauritius Ports Authority (MPA) is a para-statal body responsible for all activities relative to the port, for instance, the management of maritime traffic within the port areas, management of the port facilities, unloading and loading of goods. The port premises include hazardous facilities like bulk depots of petroleum products and storage areas of chemicals, a coal depot, the Fort George power station, cement depot, silos of flour, rice and grains, etc. Together with other institutions such as the National Coast Guard (NCG), or the Mauritius Fire and Rescue Services, it has to ensure the security of port premises whereby access is either restricted or prohibited for obvious security reasons.

The MPA is one of the first stakeholders called upon to ensure the safe movement and handling of chemicals as per the consignment notes received in Mauritius. It houses most of the imported chemical substances including petroleum products within the Mauritian territories and is the exit point of any such goods leaving Mauritius for inter-island trade. It provides facilities for the temporary storage of hazardous goods within the port premises until the consignments are cleared subject to meeting all official conditions as stipulated by applicable legislation, for instance the Customs Act, Freeport Act or the DCCA.

It acts as an enforcing authority for other stakeholders involved in the management of maritime traffic of hazardous goods for instance the Cargo Handling Corporation Ltd (CHGL), international and national maritime companies, freight forwarders, etc. based on the port areas.

(b) National Transport Authority

The National Transport Authority (NTA) is a para-statal body responsible for vehicles' registration, and inspection prior to issuance of a Fitness Certificate. It also issues renewable licences to vehicles used as good vehicles and has to keep records of all types of vehicles registered among which are the carriers of chemicals on public roads.

5.1.12 Ministry of Agro Industry and Food Security (MoAIFS)

The Ministry of Agro Industry and Food Security (MoAIFS) oversees all agricultural activities in Mauritius covering the sectors of sugar, non-sugar, livestock and forestry. It ensures the safety and the good quality of the products that are being supplied in the country by considering all sanitary and phyto-sanitary requirements. It has various departments and divisions which are responsible for matters linking agriculture and chemicals, for e.g. registration and testing of agrochemicals before their commercialisation, testing residues of pesticides in locally grown crops and conducting planter education for the proper use of agrochemicals.

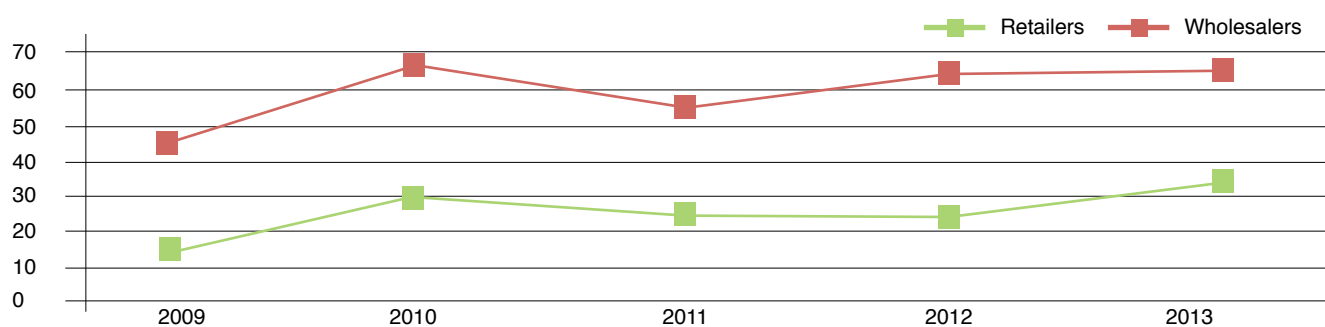
The Pathology Division or the National Plant Protection Office (NPPO) is one of responsible entities of this Ministry in the area of chemical management related to agricultural commodities and is also the focal point of the International Plant Protection Convention (IPPC) of the Food and Agriculture Organization (FAO). The NPPO is concerned by the imports of chemicals related to plants, through section 19 of the Plant Protection Act 2006. The NPPO provides Plant Import Permits (MUR 50 being charged as service fee).

The Entomology Division of the Ministry is responsible for issues related to pest control with a view to protect plants and ultimately the agricultural economy and the country's ecosystem. It monitors and manages pests and moreover conducts research and development in sustainable pest control programmes. It also ensures that safe chemicals are being used for pest control including Integrated Pest Management (IPM). IPM has been adopted for instance through the use of sterile insect technique for the control of fruit flies, biological control of the spiraling white fly, coconut beetle and fruit fly. Furthermore, it promotes the use of insecticides which are more environmentally friendly and a reduction in heavy use of insecticides. The Division provides services of spraying of pesticides in orchards or backyards against a small payment.

The MoAIFS provides analytical services through two divisions directly under its purview namely the Agricultural Chemistry Division (ACD) and the Food Technology Laboratory (FTL). The ACD conducts routine analysis to assist planters and livestock breeders at its laboratory equipped with modern analytical apparatus. Various types of tests are conducted including on pesticides residues, soils and fertilisers, compost, plants, animal feeds or water so that soil fertility, water quality, nutritional value of feeds can be determined easily thereby helping planters. The FTL is further sub-divided into other units and sections such as Dairy Chemistry Division, Organic Chemistry Lab whereby tests are carried out to ensure the safety and quality of foods. Accordingly, these two divisions of the MoAIFS are also involved in managing chemicals in Mauritius, especially since the ACD is represented in the DCCB and its sub-committee on Agricultural.

As mentioned in Section 4.1.10, all licences for the sale of fertilisers are issued and renewed annually by the ACD against payment of the prescribed fees as per the CFCA. The applicants are required to respect conditions prescribed on the Application Form regarding this sale. Two types of licences are delivered, namely for wholesalers and retailers after that these selling points are inspected by the representatives of the MoAIFS. As of 01.09.2013, 100 licenses have been issued or renewed to 33 retailers and 67 wholesalers of fertilisers. Fortunately, no revocation of licences due to malpractices has occurred since the past few years. Figure 5.6 shows the number of licences issued for the sale of fertilisers from 2009 to September 2013.

Figure 5.6: Number of licences issued for sale of fertilisers from 2009 to September 2013



Source: ACD, MoAIFS

The Ministry of Agroindustry and Food Security also comprises of a few parastatal bodies. Two of these are discussed below as they are involved in the area of agricultural chemicals whereby they work in close collaboration with local planters assisting them in the Sound Management of Chemicals.

(a) Agricultural Research and Extension Unit (AREU)

The Agricultural Research and Extension Unit (AREU) under the Food and Agricultural Research Council (FARC) is responsible for research in the vegetables, fruits, ornamentals and livestock sector. It conducts research related to the control of pests and diseases of crops and is responsible for the advisory services and training of farmers. The Entomology Division and Plant Pathology Division are involved in the testing of agro chemicals on respective crops prior to their recommendation to the Dangerous Chemical Control Board (DCCB) on their use in agricultural production. The Extension and Training Division of AREU provides training to farmers on safe and judicious use of pesticides. More details on these activities are given in Chapter 10. The AREU also promotes integrated pests and diseases management to farmers to reduce the pesticides load and thereby assists the DCCB in the classification, registration and control of pesticides.

(b) Mauritius Cane Industry Authority (MCIA)

The Mauritius Cane Industry Authority (MCIA) formerly known as the Mauritius Sugar Industry Research Institute (MSIRI) was the first research institute to have existed in Mauritius. It is mandated to carry out high quality research and development on sugar cane and other crops that meet the agricultural, commercial, and societal needs of Mauritius. Until 2012, when the Ministry of Agro Industry & Food Security (MoAIFS) took it over, it had been operating as a semi-private research institute for almost more than half a century.

The institution is regularly involved in conducting testing activities on agrochemicals including herbicides imported to protect sugar cane and other crops. The MCIA has, as such, been conducting over several decades the registration of these agrochemicals and carrying out efficacy trials prior to give any recommendations on their use. The ex-MSIRI has a rich publication list for all its activities pertaining to Management of chemicals. It is represented at the DCCB and the DCAC owing to the expertise of their representatives. It must be noted that it was among the first laboratories to be accredited to the ISO/IEC 17025 Standard. As mentioned in Chapter 2, the assistance of the ex-MSIRI was sought for chemical analysis during the implementation on the NIP on POPs.

The ex-MSIRI has been a key contributor to the success of the sugarcane industry in Mauritius through extensive research in the sector. The institution is also actively involved in chemical management in Mauritius, particularly for the sound use of various types of agricultural chemicals for the following purposes:

- Crop Improvement Programme
- Crop Management

- Crop Protection
- Monitoring of pesticide residues in sugar and in surface waters and groundwater.

The laboratories of the MCIA operate a quality management system in compliance with ISO/IEC/17025 and the institution is recognized as a centre of excellence for research on agriculture in the region.

5.1.13 Ministry of Environment & Sustainable Development (MoESD)

The Ministry of Environment & Sustainable Development (MoESD) is responsible for the conservation, protection and management and the protection of the environment in the Republic of Mauritius. Its technical arm, the Department of Environment (DoE) was established in 1989 as an institutional response to new environmental challenges. The DoE is called upon, under the Environment Protection Act (EPA) promulgated in 1991, to ensure protection, planning, monitoring, coordination, enforcement and awareness raising on the environment. As of January 2014, there are 11 units functioning under the DoE as shown below:

- Sustainable Development, Policy and Planning Division
- Environmental Assessment Division
- EIA/PER Monitoring Division
- Climate Change Division
- Environmental Law and Prosecution Division
- Pollution Control and Prevention Division
- Education & Information Division
- Environmental Guidelines Division
- Coordination and Project Implementation Division
- Integrated Coastal Zone Management Division
- National Environmental Laboratory

Since its existence, this Ministry has collaborated with other institutions to create a better understanding on the environment and promoting the concept of sustainable development within Mauritius. The MoESD is mandated to protect the environment by various means for instance to respond and investigate in pollution cases, to monitor environmental quality of natural resources, to educate and sensitize people on environmental issues, to issue Environmental Impact Assessment (EIA) and Preliminary Environment Report (PER) licences as well as to issue notices in case of breach of the legislation. Such commitments towards environmental protection were indeed reinforced when the EPA has been timely amended.

The above units are strengthened by the 'Police de l'Environnement' a unit created in 2000 wherein Police Officers are seconded for duty to assist officers of the MoESD in the protection the environment. This unit operates on the basis of public complaints further to harm being caused or threats to the environment, for e.g. during illegal waste disposals, emission of smoke from factories or vehicles, release of bad odours as well as high noise levels affecting neighbourhoods. Following such complaints, police officers go on-site to attend the respective problems and may serve notices to those contravening with legislations while there has been some isolated cases where drivers of waste carriers had to be reprimanded. Moreover, for developing and reinforcing environmental policies at national level, specific committees have to be set up to ensure an effective coordination between stakeholders, the two most important ones being:

- The National Environment Commission (NEC) with an aim of discussing about national environmental policies.
- The Environment Coordination Committee (ECC) which is multi-stakeholder committee from various Ministries and authorities.

The MoESD is represented at the DCCB as an Enforcing Agency as well as in its sub-committees and forms part of the Advisory Council of DCCA. It has to respond to any accidents involving chemicals and to oil spills within the Mauritian territory. The Ministry has devised the National Oil Spill Contingency Plan [13] for this purpose. In 2006, an Oil Spill Pocket Book was published by the Integrated Coastal Zone Management (ICZM) section of the Ministry and distributed to all relevant stakeholders.

The MoESD is the focal point for the Stockholm Convention on Persistent Organic Pollutants (2004), the Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987). Accordingly, it has been the leading institution in a several national projects specifically related to chemical management as per the above-mentioned MEAs. These projects saw the collaboration of various national stakeholders and are shown in Table 5.4.

Table 5.4: National projects relevant to the SMC conducted by the MoESD			
Theme	Period	Purpose	Activities
National Implementation Plan (NIP) on enabling activities for the Stockholm Convention on Persistent Organic Pollutants (POPs)	2003 - 2005	This project was launched further to the adoption of the Stockholm Convention in 2001 which Mauritius is a signatory.	<ul style="list-style-type: none"> The setting up of a POPs Task force Inventories on POPs pesticides and on transformers used in power generation, soil sampling and analysis, estimations of the release of Dioxins and Furans (unintentional POPs generated during combustion) Technical capacity assessment for existing analytical laboratories Public awareness activities.
Phasing out of ChloroFluoroCarbons (CFCs) as per the Montreal Protocol on Ozone Depleting Substances	2005 - 2010	This project was launched further to the adoption of the Montreal Protocol in 2001 for which Mauritius is a signatory. Initially in 1999, any goods containing CFCs were banned.	<ul style="list-style-type: none"> Shift from CFCs to HCFCs
Mercury Assessment Programme and Chemical Management of Cadmium, Lead and Mercury.	2006 - 2009	The project was launched further to the UNEP's Governing Council decision in 2005, whereby countries were requested to come up with an action plan to manage the three toxic heavy metals.	<ul style="list-style-type: none"> The setting up of partnership areas between public stakeholders to manage Cadmium, Lead Mercury in Mauritius Assessment of Cadmium, Lead Mercury from different applications Analysis of Cadmium, Lead Mercury from environmental media.
National project on the sustainable management of POPs in Mauritius	2009 - 2013	The project is being done with other stakeholders like the MoHQL and the UNDP on a medium term basis. Funding from GEF and other donor-partners available to the tune of US \$ 1.9 Million	<ul style="list-style-type: none"> Disposal of POPs pesticides and PCBs Reduction in the use of DDT Cleaning up of DDT contaminated sites Alternatives to DDT in vector control
HydroChloroFluoroCarbons (HCFCs) Phase out Management Plan (HPMP) as per the Montreal Protocol on Ozone Depleting Substances	2013 - 2030	The plan is aimed to shift from HCFCs to alternative substances with a lower Global Warming and Ozone depletion potential	<ul style="list-style-type: none"> Reduction of imports of HCFCs Capacity building of stakeholders for phasing out HCFCs Gradual elimination of HCFCs by the year 2030 from Mauritian territories.
National HazMat Contingency Plan	2012 - 2014	This project is being done for hazards identification.	<ul style="list-style-type: none"> Draft HazMat plan prepared
Government of Mauritius/UNDP/ UNEP Partnership on the Sound Management of Chemicals	2013 - 2014	Among all project deliverables, is a separate component on Mercury assessment	<ul style="list-style-type: none"> Compilation of a Level One Mercury Report

5.1.14 Ministry of Local Government and Outer Islands (MoLGOI)

The Ministry of Local Government and Outer Islands (MoLGOI) is in charge of overseeing activities conducted by all the local authorities in the Republic of Mauritius – namely Municipal Councils, District Councils, Village Councils and the islands of Agalega and St Brandon and all public beaches. It is also responsible for solid and hazardous waste management. In this respect, the Ministry is responsible for the operation of the sanitary landfill site at Mare Chicose and the five transfer stations scattered over the island, issuing solid waste carrier licences and intervening in any illegal dumping of solid wastes. Municipal Solid Waste (MSW) is collected by Local Authorities and disposed of at the Mare Chicose landfill before transiting through transfer stations. Until 2011, practically all the solid wastes generated in Mauritius were landfilled. The first large-scale private recycling and composting plant in Mauritius at La Chaumière, having an annual capacity of 90 000 tonnes of wastes, came into operation in mid-September 2011.

Figure 5.7: Amount of Municipal Solid Wastes landfilled



Source: GAD, MoHQL July 2013

As Mauritius is a signatory to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal since November 1992, the MoLGOI is the designated Competent Authority for the Basel Convention in Mauritius and the enforcing agency for hazardous wastes. It is responsible for enforcing the Environment Protection (Standards for Hazardous Wastes) Regulations 2001 for the management of hazardous wastes and receiving and responding to notification of transboundary movements of hazardous wastes. It undertakes enquiries for the export of solid hazardous wastes and is working towards the development of a database for the local wastes contractors in Mauritius as of November 2013. It also commissioned the HWI Report for Mauritius in 2012. [10]

(a) Mauritius Fire and Rescue Service (MFRS)

The Mauritius Fire and Rescue Services formerly the Government Fire Services falls under the aegis of the MoLGOI. It operates all Fire Stations in the Republic of Mauritius and has dedicated trained officers for firefighting and rescue service in various types of emergency operations such as interventions in fires or any accidents involving chemicals for e.g. spillages. The MFRS is one of the first institutions solicited by the public for assistance in emergency situations. The department also gives fire clearances and issues fire certificates needed for enhancing a good safety & health culture in Mauritius under the OSHA and the DCCA. It is also strongly highly involved in fire awareness trainings and related activities such as fire drills and simulation exercises for various other institutions, which may be handling, stocking or using inflammable substances or chemicals in general.

5.1.15 Ministry of Labour, Industrial Relations and Employment (MoLIRE)

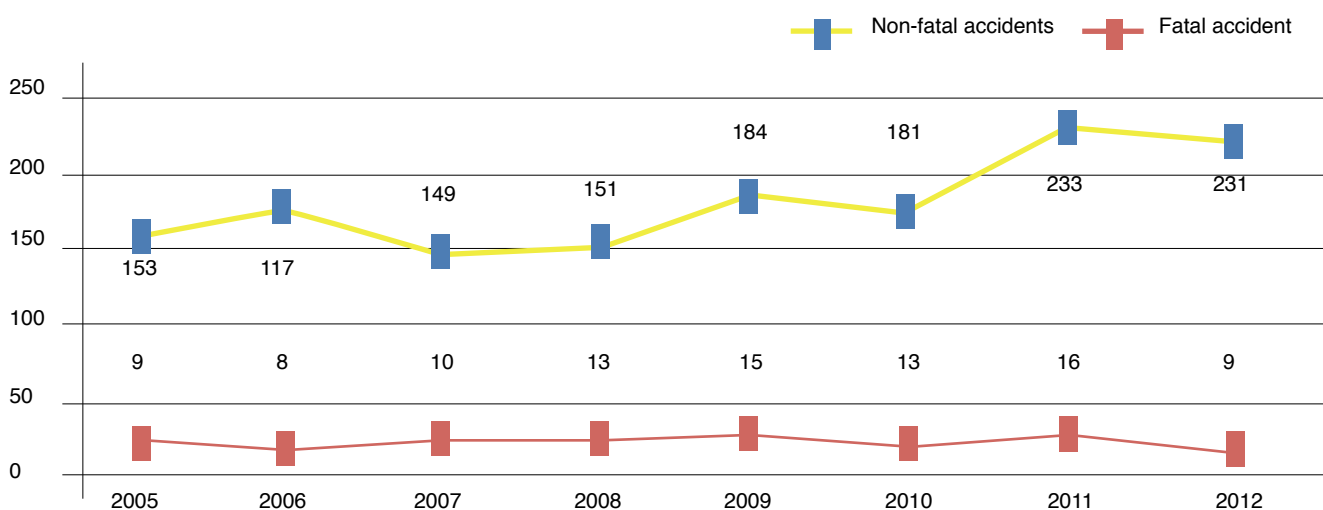
The Ministry of Labour, Industrial Relations and Employment (MoLIRE) is responsible for managing issues related to employment and for regulating labour conditions in Mauritius. There are two main acts which this Ministry has to enforce namely the Employment Rights Act (ERA) and the Industrial Relations Act (IRA), both were revised in 2008. In respect of chemicals, the most specific legislation which it must enforce is the Occupational Safety and Health Act (OSHA) 2005. The MoLIRE is an enforcing agency of the DCCB and is represented in its sub-committees as well as in the DCAC.

Within the Occupational Safety and Health Inspectorate (OSHI) of the MoLIRE are employed Engineers and other professionals such as Occupational Safety and Health inspectors and officers who are involved in the ensuring that employers are giving proper consideration, as per the OSHA 2005, to the health and safety of their employees. The officers of the MoLIRE conduct training sessions for employees from various sectors at either the Ministry or on-site basis whereby they gain more knowledge on the hazards and risks applicable to their employment. Consequently, for workers handling or exposed to chemicals, such training programmes are highly beneficial. Additional details are given in Chapter 10.

One of the major responsibilities of the MoLIRE is to ensure the safety of workers and workplaces through periodic examinations of hazardous installations such as dangerous machinery, steam boilers, gas plants or foundries. Such examinations are only conducted by registered inspectors as per the OSHA 2005. Moreover, the Ministry has to undertake the annual registration of factories as stipulated by the same Act. As per the OSHI's Monthly Report for December 2013, 3 898 factories were registered as of the 31 of the said month in Mauritius. Consequently, officers of MoLIRE also conduct inspections and sites visits at various types of workplaces verifying that work is achieved in a sound manner, that employees are well informed of the risks from their routine activities. On the other hand, visits are also arranged further to employees' complaints.

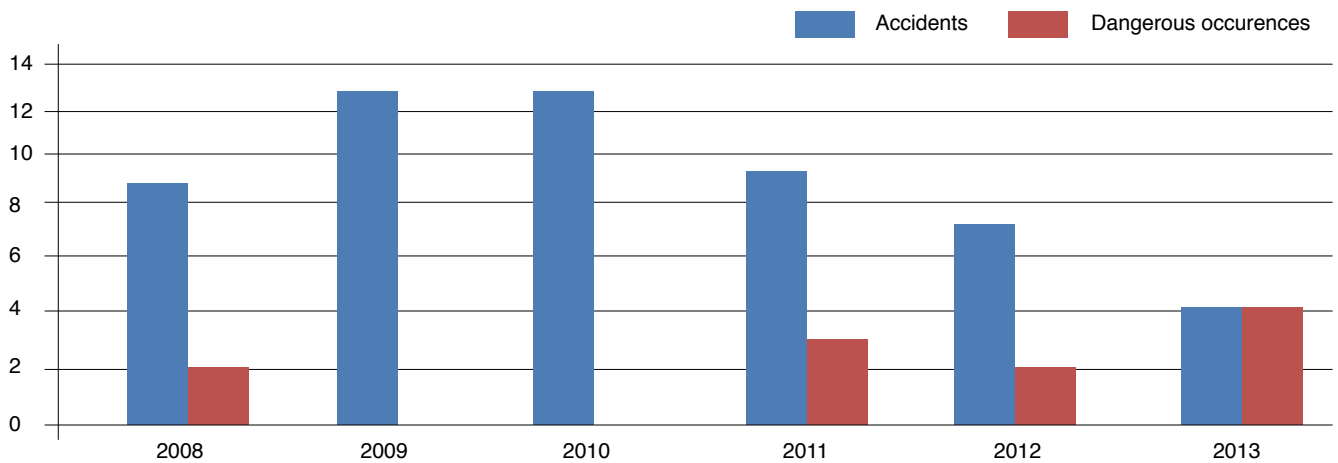
Workers exposed to chemicals must wear appropriate Personal Protection Equipment (PPE) as provided to them by their employers and take precautionary measures as well. Accordingly, it is an opportunity for these officers of the MoLIRE to recommend the use of such PPE or to verify if these PPE are in fact worn while working during such inspections or visits. The MoLIRE is also called upon to investigate into all types of workplace accidents, dangerous occurrences and any occupational diseases notified to it by employers. Figure 5.8 shows the number of recorded workplace accidents for the period 2005 – 2012.

Figure 5.8: Number of workplace accidents notified to the MoLIRE for the period 2005 - 2012



As regards the number of occupational accidents and dangerous occurrences which occurred specifically due to chemicals, the following figures have been recorded by the OSHI from 2008 to 03.12 2013 as shown in Figure 5.9.

Figure 5.9: Notified workplace accidents and Dangerous occurrences related to chemicals



As observed from the Figures 5.8 and 5.9, the number of workplace accidents and dangerous occurrences do not show any clear trends. The obvious reason for this situation is that these remain highly unpredictable events. As a good practice in the whole SMC process, it is nevertheless important to identify the sectors where these accidents occur, type of workers affected and their corresponding activities as recommended in Chapter 3.

5.1.16 Ministry of Industry, Commerce & Consumer Protection

The Ministry of Industry, Commerce & Consumer Protection (MoICCP) has a broad scope of responsibilities to facilitate the development of an innovation-led industrial sector, create a conducive commercial environment and provide for an effective protection of consumers. The MoICCP consists of two main divisions namely, the Industry Division and the Commerce Division, with several departments and para-statal bodies. The most relevant departments and parastatal bodies for the Sound Management of Chemicals are described below, while the role of MAURITAS is described in Chapter 9.

(a) Mauritius Standards Bureau

The Mauritius Standards Bureau (MSB) is the national certification body in Mauritius providing independent assessments under the National Quality System Certification Scheme to any public and private institution. The MSB is a service provider for standardisation, quality assurance, testing and metrology fields. It is a member of the International Organisation for Standardisation (ISO) and is represented in a few of its technical committees. It is called upon to develop Mauritius Standards (MS) based on original ISO Standards such as the MS ISO 9001.2000 in order to enhance the quality and safety of products produced locally as well as the quality of services of local companies whereby the inscription “MSB Certified Product” or “MSB Registered Firm” are used by them. As of August 2013, the Chemical and Chemical Technology section has introduced 42 Mauritian Standards in different products like consumer products e.g. soaps and detergents, fertilisers or fireworks. Table 5.5 shows a list of some of these Mauritian Standards.

Table 5.5 : Mauritian Standards for developed for chemical products

Standard	Description
MS 2:1988	Specification for rectified spirit
MS 3:2000	Emulsion paints for interior and exterior use
MS 8:1985	Specification for pure soap for laundry
MS 12:1980	Standard for toilet soap
MS 15:1984	Specification for toothpaste
MS 50:1988	Specification for scouring powder
MS 51:1988	Specification for compounds and mixed fertilisers

MS 52:1983	Specification for ammonium sulphate, fertiliser grade
MS 53:1984	Specification for potassium sulphate, fertiliser grade
MS 54:1984	Specification for potassium chloride (muriate of potash), fertiliser grade
MS 55:1985	Specification for superphosphates
MS 58:1988	Specification for liquid shampoo
MS 67:1986	Specification for insecticidal diazinon
MS 78:1988	Specification for sodium hypochlorite solution
MS 80:1989	Specification for liquid detergent for household dishwashing
MS 81:1989	Specification for lime paint
MS 87:1991	Specification for road marking paint
MS 88:1993	Specification for diuron water dispersible powder and wet flowable concentrates
MS 132 Part 1:2003	Fireworks – Part 1: Classification of fireworks
MS 132 Part 2:2003	Fireworks – Part 2: Specification of fireworks
MS 132 Part 3:2003	Fireworks – Part 3: Methods of test for fireworks

The MSB comprises of different sections equipped with analytical laboratories for the regular testing of parameters in various products like foods, textiles, cement, materials, etc. More details on its testing capacities are given in Chapter 9. In 2012, the Chemical and Chemical Technology section performed 2 592 chemical tests on various such products and 1 573 chemical tests from January to August 2013. These testing services are payable and it introduced a few schemes for customers in October 2013. The MSB is a member of the DCCB and its sub-committees.

(b) Assay Office

The Assay Office (AO) is a department under the MoICCP which is responsible for implementation of the Jewellery Act. The legislation regulates and control the manufacture, sale and imports of jewellery made up of precious metals like gold, silver and platinum or their alloys. It also governs identification and grading of gemstones. The AO is a member of the International Association of Assay Offices (IAAO) and was the first public institution to receive the ISO/IEC 17025 Accreditation from MAURITAS. It comprises of two laboratories namely the Assay Laboratory and the Gemology Laboratory which use different analytical techniques for determining the relevant quality or grade of jewels and gemstones as applicable. It is also involved in raising awareness via pamphlets published to provide more information on its activities and including on the use of harmful substances like Mercury. Additional details are given in Chapter 10.

5.1.17 Ministry of Civil Service & Administrative Reforms.

The Ministry of Civil Service & Administrative Reforms is responsible for ensuring professionalism and excellence in the public sector via innovations and administrative reforms on a periodic basis while supporting the personal development of public officers. In this respect, the MoCSAR has introduced the Performance Management System (PMS) which is a management tool seeking to enhance better efficiency of the human resources within the public sector. It is called upon to provide the necessary conditions and a good working environment within the public service which is composed of about 50 000 – 60 000 employees spread across various Ministries and related departments.

This Ministry also has the responsibility towards Occupational Safety & Health (OSH) for the public sector through its OSH Unit which is called upon to ensure compliance with the OSHA 2005, through various activities like conducting inspections, site visits, training sessions, accident investigations, advisory services on OSH matters for instance provision of PPE, etc. It is noted that the MoCSAR complements the MoLIRE, which caters for employees of the private sector in protecting the health and safety of workers i.e. includes protection against hazardous substances and facilities commonly used in the Governmental institutions. To this end, a Safety and Health policy has been developed since 2010 by the MoCSAR.

5.2 SUMMARY DESCRIPTION OF MINISTERIAL AUTHORITIES & MANDATES

The responsibilities of the different Ministries and the respective para-statal bodies under their purview for managing chemicals may be subject to modifications as ministerial mandates may undergo some periodic changes. Table 5.6 depicts these responsibilities as of January 2014.

Table 5.6: Summary of Responsibilities of Governmental Institutions						
Ministry concerned	Import	Storage	Transport	Distribution/warehousing	Use/handling	Disposal
Environment	x	x	x	x	x	x
Health	x	x	x	x	x	x
Labour		x	x	x	x	
Agriculture	x	x			x	
Trade/Commerce			x	x		
Industry		x	x	x		
Finance	x	x				
Transport			x	x		
Interior/ Civil Defense	x	x			x	
Justice						
Foreign Affairs	x					

Key: X = Responsible as per mandate

It is found from the above table that different Ministries are responsible for managing chemicals through the different stages of their life cycle. However, the Ministries may not have adequately trained and skilled staff as well as other dedicated and resources for this specific purpose. Another area for improvement is to develop more synergies between stakeholders who have complementary responsibilities as per their mandates and therefore to prevent institutions from functioning in isolation or to minimise as far as practicable any duplication of their tasks. Various advantages can be associated with a synergistic approach on the SMC, for instance stronger networking and more effective communication with stakeholders, or better management of funds and other resources. Table 5.7 below describes institutions with complementary responsibilities for the SMC and indicates possible outcomes with a synergistic approach.

Table 5.7: Institutions with complementary SMC responsibilities		
Institutions	Complementary areas	Possible outcomes with synergistic approach
<ul style="list-style-type: none"> DCCB/OHU (MoHQL) OSHI (MoLIRE) MoCSAR 	<ul style="list-style-type: none"> Occupational Health Awareness for workers Promulgation of safe working practices 	<ul style="list-style-type: none"> Identification of risks groups within occupations/sectors More knowledge on trends of diseases and accidents related to chemicals. Greater enforcement & prevention
<ul style="list-style-type: none"> OSHI (MoLIRE) IID (MoSSRI) 	<ul style="list-style-type: none"> Investigation and examination of cases of affected workers Compensations paid to workers further to industrial accidents & diseases 	<ul style="list-style-type: none"> Identification of working activities presenting greater health risks due to chemicals. Specific data on compensations (governmental expenditure) paid to workers after accidents or contracting diseases due to chemicals
<ul style="list-style-type: none"> DCCB (MoHQL) PB (MoHQL) CPU (MoICCP) 	<ul style="list-style-type: none"> Classification and labelling of consumer goods Inspections at selling points, warehouses 	<ul style="list-style-type: none"> Identification of consumer products presenting health risks Ensuring that products are labelled according as per international systems for instance the GHS. Greater enforcement & control measures Increased public awareness on hazardous goods

<ul style="list-style-type: none"> • GAD (MoHQL) • ACD/FTL (MoAIFS) • ACD, MCIA (MoAIFS) • MSB (MoICCP) • AFRC (MoF) 	<ul style="list-style-type: none"> • Testing of pesticides and their residues as well as other chemical contaminants in foods as fruits, vegetables, fish, seafoods, animal feeds etc as applicable. 	<ul style="list-style-type: none"> • More knowledge on food contaminations due to substances like pesticide residues, heavy metal residues, etc. • Greater emphasis on food safety management systems
<ul style="list-style-type: none"> • GAD (MoHQL) • NEL (MoESD) • CWA (MoEPU) • WMA (MoEPU) • ACD, MCIA (MoAIFS) • AFRC (MoF) 	<ul style="list-style-type: none"> • Testing of chemical pollutants in waters from various sources e.g. rivers, treated effluents, boreholes, lagoons, agricultural lands, industries, etc.as applicable. 	<ul style="list-style-type: none"> • More knowledge on regions most affected with water pollution thus enabling a comprehensive water quality index within the country. • ‘Polluter pays principle’ can be effectively implemented with more data on air quality monitoring.
<ul style="list-style-type: none"> • NEL (MoESD) • FoE (UoM) 	<ul style="list-style-type: none"> • Testing of air pollutants and other gasous emissions in outdoor environments. 	<ul style="list-style-type: none"> • More knowledge on regions most affected with air pollution thus enabling specific studies on respiratory diseases in different groups e.g. workers or children. • ‘Polluter pays principle’ can be effectively implemented with more data on air quality monitoring. • Permissible exposure limits can be developed for specific contaminants at workplaces.

5.3 CONCLUSIONS AND RECOMMENDATIONS

At present, the management of chemicals is spread over many government institutions and there is scope for simplification and improvement in the coordination mechanisms. To meet with growing demands for exerting regulatory controls and enforcing relevant legislation such as the DCCA, a dedicated institution may be established in the future so that it can function with permanent staff and all appropriate facilities needed like infrastructure, logistics, inspection vehicles, etc. to manage chemicals at national level.

5.3.1 More emphasis on SMC

There are gaps in terms of responsibilities and capacities of Government institutions as regards the SMC. The best example to illustrate this situation is the MoHQL which is more inclined towards offering medical treatment and health care services with its staff population above 10 000, various medical facilities and other associated resources. Although mandated to manage chemicals, it has unfortunately, a very low number of staff and rudimentary resources for this specific purpose. It is recommended that more emphasis be laid on chemicals management at Ministry level by providing adequate resources and facilities.

Respective Ministries keep official records of activities falling under their respective purviews for e.g. number of awareness/training sessions conducted annually, number of accidents at workplaces, number of environmental complaints received or number of workplace inspections carried, etc. Since this data is usually displayed on their respective websites, it is concluded that the governmental institutions do share such information except data deemed confidential. It is, however, recommended that data shown can be specifically be related to chemicals, for instance the data on workplace accidents compiled by the MoLIRE should be further split to show exact figures for the industries using chemicals and which type of workers affected. This would eventually help to focus on preventive measures and identify groups at risk. More details on Data management are given in the Chapter 8 to underpin the above recommendation given that, as of January 2014, Mauritius has neither a dedicated chemicals authority nor a centralised data centre on chemicals.

5.3.2 Complementary responsibilities

One loophole of the existing institutional system is the overlapping of responsibilities between institutions, for instance, the testing work on similar media being conducted by analytical laboratories of different Ministries. Such situations could be avoided so that allocated resources could be more efficiently used to provide testing of new parameters i.e. increasing the scope of testing.

5.3.3 More collaboration

Collaboration between the governmental stakeholders on SMC areas only occurs through inter-ministerial mechanisms and multi-stakeholder projects involving various Ministries at national level. As described in the Chapter 3 of the NCP, the co-operative work on levels of pesticide residues in locally grown fruits and vegetables can be considered as a good example of collaboration, which can also be strengthened enabling other Governmental institutions to form part of a joint national mechanism on chemical contaminants in foods. It is suggested that there be more collaborative works and sharing of information at national level so that SMC matters can be addressed via a multi-stakeholder approach instead of each Governmental institution working independently.

It may happen that the non-governmental stakeholders including the public at large may not be familiar with the exact responsibilities of Ministries or their para-statal bodies for managing chemicals. For instance, anybody or any company wishing to trade in chemicals for the first time, may not be fully aware of the role of the DCCB and its involvement as the main enforcing agency for chemical trade. Accordingly, this situation creates confusion, may lead to time loss or may be considered as a trade barrier. It is recommended that Ministries ensure that their roles, responsibilities and services offered are properly communicated to all. This would help any new or foreign company seeking to launch business in Mauritius but who may not be familiar with the institutions. In brief, the Governmental authorities should be perceived as partners for fostering trade and economic development. It is suggested that the Governmental web portal provides as much information as possible on the DCCB and other key stakeholders in respect of chemicals in Mauritius.

Chapter 6

ROLE OF CIVIL SOCIETY IN THE MANAGEMENT OF CHEMICALS

The mechanism for Sound Management of Chemicals would be successfully implemented if an integrated approach is adopted encompassing all relevant stakeholders. In this very context, along with respective Ministries and other governmental agencies, civil society is expected to actively participate towards achieving the goals of Sound Management of Chemicals. Indeed the activities of these stakeholders are complemented by the well-defined roles and responsibilities of the public sector stakeholders.

Stakeholders outside the government who contribute to the sound chemicals management are normally from Academia and research groups, Non-Governmental Organisations (NGOs) such as environmental or consumer associations amongst others. Accordingly, their activities with respect to chemicals are quite varied, for instance awareness campaigns on chemicals for the public at large, training and education by the private sector federations for their respective employees or members, research work by institutes and universities, or community projects conducted by NGOs. A holistic approach partnership would indeed help towards the creation of a chemical safety culture in line with the SAICM 2020 Goal.

6.1 ACADEMIC INSTITUTIONS

Over the years, many activities have been conducted by Universities, NGOs, industry associations and other stakeholders with an aim of creating a greater awareness on chemicals thereby helping to protect human health and the environment. All these activities are described below:

6.1.1 University of Mauritius

Formerly the College of Agriculture, the University of Mauritius (UoM) became the first tertiary level institution of Mauritius in 1976. Situated at Réduit, a hub for knowledge in the country, the University has gradually expanded and comprises of five Faculties with several Departments and Centres as of January 2014. The UoM imparts formal education and training from undergraduate to Post Doctorate levels in various fields of study whereby its staff and students regularly produce research papers. It has been actively collaborating with local, regional and international institutions and has played important roles in national policies and programmes.

Since its creation, thousands of students (including foreign ones from the Indian Ocean islands and Africa) have followed its proposed courses. Courses are structured to suit the demands of the local job market.

(a) UoM's role on SMC issues

UOM is represented in the Dangerous Chemical Advisory Council. Moreover, through the activities of its Faculties and Departments, the UoM also participates in the sound management of chemicals in Mauritius as described below:

(b) As an education/training provider

The UOM is involved in producing future working professionals like Chemists, Engineers, Occupational Safety & Health practitioners, Researchers, etc. who would be eventually involved in process of sound management of chemicals. Further to specific demands, it can also propose tailor-made courses for workers wishing to upgrade their existing skills and qualifications. Students get an opportunity to be accustomed to the management of chemicals during their industrial training arranged by the UoM at host institutions. In Chapter 9, details of the courses currently offered by the UoM have been provided.

(c) As a service provider

Various departments of the UOM are involved in monitoring, analytical and research works on a contractual basis through consultancies or agreements with other institutions. The Consultancy and Contract Research Centre (CCRC) a specialised unit of the UoM, was created in 1998 under the aegis of the Pro-Vice-Chancellor for Research, Consultancy & Innovation. The CCRC has its own staff to conduct projects and for write-ups of technical papers. It is registered with the European Commission and submits technical proposals for national and regional tenders. Some specific activities related to the Sound Management of Chemicals in Mauritius whereby the UoM has been involved are described below:

- Enabling activities for the Stockholm Convention on POPs

Academics from the UoM acted as technical consultants (POPs Task Manager & Economist) for the National Implementation Plan for enabling activities of the Stockholm Convention on Persistent Organic Pollutants (POPs). Additional details are available in the NIP on POPs. [11]

- Baseline Study Report

In 2007, two Academics from the Department of Chemistry and the Department of Chemical Engineering produced a country report entitled Baseline Study towards a non-toxic Africa. The study was conducted further to initiatives from the Basel Convention Regional Centre, now known as the Africa Institute and the Swedish Chemical Agency, KEMI, aimed at collecting baseline information for chemicals used and chemical wastes being generated in Mauritius. Financial assistance for producing the report was obtained by the Government of Sweden through KEMI. [11]

Through this pilot study, a preliminary overview of the situation of chemicals in Mauritius had been obtained for the SAICM implementation at national level. Its main objectives were as follows:

- 1) To establish baseline data on National Chemicals and Wastes.
- 2) To assess the capacity of national institutions to manage chemicals and disposal facilities.
- 3) To review environmental legal frameworks and regulations.
- 4) To make an inventory of: (i) Industries using chemicals (ii) Chemical importers / exporters.
- 5) To assess the capacity and needs for training.

- Hazardous Wastes Inventory

A team of the Department of Chemistry conducted a study in 2012 on hazardous wastes in Mauritius for the Ministry of Local Government and Outer Islands as client.

In addition to the above activities, the UoM offers air quality monitoring services through its Department of Civil Engineering (under the Faculty of Engineering) upon requests from clients, which can be from the private sector or the governmental sector. The said department comprises of an Air Pollution Monitoring Unit which performs Continuous Source Emission monitoring for the determination of gaseous emissions from stationary sources such as factory chimneys or stacks. The mobile equipment operated in industrial environments is capable to measure levels of pollutants and indicators:

- Sulphur dioxide
- Oxides of Nitrogen
- Carbon monoxide
- Carbon dioxide
- Residual oxygen
- Total Hydrocarbon
- Particulate Matter

6.2 RESEARCH INSTITUTES

6.2.1 Mauritius Cane Industry Authority (MCIA)

The Mauritius Cane Industry Authority (MCIA) formerly known as the Mauritius Sugar Industry Research Institute (MSIRI) was the first research institute to have existed in Mauritius. It is mandated to carry out high quality research and development on sugar cane and other crops that meet the agricultural, commercial, and societal needs of Mauritius. Until 2012, when the Ministry of Agro Industry & Food Security (MoAIFS) took it over, it had been operating as a semi-privatised research institute for almost more than half a century. The ex-MSIRI has been a key contributor to the success of the sugarcane industry in Mauritius through extensive research in the sector. The institution is also actively involved in chemical management in Mauritius, particularly for the sound use of various types of agricultural chemicals for the following purposes:

- Crop Improvement Programme
- Crop Management
- Crop Protection
- Monitoring of pesticide residues in sugar and in surface waters and groundwater.

The institution achieves its objectives through a wide array of research and testing in while also considering the economic and environmental implications. The laboratories of the MCIA operate a quality management system in compliance with ISO/IEC/17025 and the institution is recognized as a center of excellence for research on agriculture in the region.

6.2.2 Mauritius Oceanography Institute

The Mauritius Oceanography Institute (MOI) operates under the aegis of the Prime Minister's Office. It has been conducting projects meant for the development of a land-based oceanic industry. New products such as marine pharmaceuticals based on sea weeds are being developed in this context.

6.2.3 Centre for Biomedical and Biomaterials Research

The Centre for Biomedical and Biomaterials Research (CBBR) is a recently founded research centre housed in the MCIA compound and is attached to the Faculty of Science of the University of Mauritius. It is part of a few international networks like the African Network for Drugs and Diagnosis Innovation (ANDI) and the Global Biopolymer Network (GBN) and has also established collaborations with Universities with the region and internationally. The CBBR is an interface between industry and academia. It provides training and research opportunities and is involved in the development of new materials for future applications such as prevention of diseases like diabetes and cancer. The CBBR has three dedicated laboratories

equipped with modern equipment, among which is an Analytical section capable to undertake physico-chemical testing of polymers and nano-particles. The main axes of research conducted at the CBBR are in the following areas:

- (i) Advanced polymer materials and biomaterials
- (ii) Nano-drug delivery
- (iii) Development of value-added products from land and marine resources
- (iv) Biopharmaceuticals

The CBBR conducted a national workshop in 2013 to foster dialogue on the creation of a bio-polymer industry in Mauritius with assistance from an international Centre of Excellence based in Slovenia, PoliMaT. It also undertakes private consultancy works aimed at chemicals management for instance the development of bio-fertilizers as substitutes for traditional chemical-based fertilizers.

6.2.4 Mauritius Research Council

The Mauritius Research Council (MRC) is an institution which coordinates and funds research projects. The Mauritius Research Council (MRC) was set up in 1992 as an apex body to promote and coordinate Government investment in research and operates under the aegis of the Ministry of Tertiary Education, Science, Research and Technology. The MRC acts as a central body to advise Government on Science and Technology issues and to influence the direction of technological innovation by funding research projects in areas of national priority and encouraging strategic partnerships with other research organizations, academia, the private sector and investors. In the fields related to chemicals, the institutions is involved in various research topics including, Manufacturing Technologies and Waste Management.

6.2.5 Industry Groups

There have been relatively few official activities conducted by industry groups or associations in respect of the Sound Management of Chemicals (SMC) in Mauritius.

(a) APEXHOM

Further to its initiatives and proximity to the planter communities, the Association Professionnelle des Exportateurs/Producteurs de Produits Horticoles de Maurice (APEXHOM) had been one of the few examples to have conducted SMC-related activities. It was an association of producers of local fruits such as litchis and pineapples which are destined for exportation to foreign markets like the European Union.

(b) Croplife Mauritius

Croplife Mauritius is a registered association of Mauritian companies trading in agrochemicals. It was founded in 2004 by an alliance of ten such companies. It is a member of Croplife International which is a global network representing the plant science industry over six main regions and sub-regions of the world. Croplife Mauritius is part of the Eastern and Southern African region.

The members of CropLife Mauritius are called upon to adhere to their established code of conduct which encompasses both local legislations and FAO and WHO guidelines for the distribution and use of pesticides. Croplife Mauritius conducts activities about product stewardship and advocacy whereby its members or other relevant groups such as planters benefit from training and awareness programmes.

(c) Individual Service Providers

Within the private sector also exist, individual service providers which offer their services to other industries and to the public sector. These can be wastewater carriers, solid waste recyclers, transporters of petroleum products, pest control agents or

water treatment and purification enterprises. Some specialised hazardous wastes are also collected as in the case of a private company which collects old fluorescent lamps which contain Mercury for disposal.

6.3 NON GOVERNMENTAL ORGANISATIONS (NGOs)

In Mauritius, all NGOs must be duly registered with the Registrar of Associations falling under the MoLIRE. Moreover, they are grouped under the Mauritius Council of Social Service (MACOSS) an umbrella organisation promoting social, community development and voluntary actions in Mauritius. The MACOSS also fosters dialogue with different NGOs and between public and private sector stakeholders. There are a few NGOs which are active in raising awareness on general environmental issues like the protection of the natural resources or on climate change, etc. Through their activities, they may be addressing issues which are related to chemicals in Mauritius. The next section provides a description of one NGO with a direct relevance to SMC in Mauritius.

6.3.1 Pesticide Action Network Mauritius (PANeM)

The NGO Pesticide Action Network Mauritius (PANeM) exists since 2005. It is managed by an Executive Committee of 11 members and has about 20 additional members all of whom are acting on voluntary basis. PANeM is a member to the National Steering Committee on POPs chaired by the MoESD as well as the Steering Committee on SAICM Implementation chaired by the MoHQL. It also has links with international organisations such as the International POPs Elimination Network (IPEN).

Its main roles are to provide information and raise awareness on topics like hazards and problems related to pesticides, sustainable development, climate change or food security to the public, NGO partners, secondary school children and other communities. It organises awareness raising activities workshops, exchange programmes, field visits, and training sessions. Further to its commitments for the sound ecological practices aimed at preventing the use of harmful pesticides, it works towards the consolidating and dissemination of methods, techniques and adapted local technologies as alternatives to hazardous pesticides.

Since 2013, PANeM has also started to raise awareness about the toxic effects of Mercury on human health. Two booklets on Mercury intended for secondary school children have been published and distributed with funding obtained from the IPEN. In 2013, it participated in a civil society pilot project simultaneously held in nine countries around the world initiated by the Zero Mercury Working Group (ZMWG), an International consortium of NGOs in to assess mercury levels in human hairs.

Accordingly, PANeM launched a special awareness session on the effects of Mercury on health in two coastal villages comprising of families with a high fish diet. During these awareness sessions, hair samples from local women of children-bearing age were collected through a methodology established by ZMWG and eventually forwarded to the US for analysis. Results of the analysis were released in September 2013 by ZMWG in prelude to the Minamata Convention on Mercury. For Mauritius, 36 % of the results exceeded the limit of 1 $\mu\text{g/g}$ for a sample population of 25 as can be evidenced from a ZMWG publication [16]

6.4 CONSUMER GROUPS

Consumer Groups have a significant role to play in creating better consciousness among the population so that people can make the right choices and obtain the best products. There are a few consumer groups which exist in Mauritius which often voice out their concerns over various types of goods and services. They also receive complaints from consumers and take appropriate steps to defend their rights. Involvement in SMC areas by these groups have also been noted as described below.

6.4.1 Association des Consommateurs de l'Île Maurice (ACIM)

L'Association des Consommateurs de l'Île Maurice (Consumer Association of Mauritius) – ACIM, is a wide-interest consumer organisation actively involved in an extensive range of consumer issues and activities in Mauritius. It is regularly in-

volved in campaigning and/or lobbying for consumer rights while also providing consumer advice and undertaking research on policies related to consumer protection. Throughout its role as watchdog, the association has often brought forward cases related to improper use and management of chemicals.

6.4.2 Institute of Consumer Protection (ICP)

The Institute of Consumer Protection (ICP) has been involved in activities for the protection of consumers on general consumer goods, but including consumer chemicals. A few years back, the ICP requested that contents of air fresheners be tested by regulatory institutions in order to detect the presence of any carcinogenic chemicals such as formaldehyde, toluene, benzene or naphthalene. It was in fact further to results of laboratory analyses published in the EU by a major consumer association on goods such as air fresheners or scented candles whereby chemicals causing highly adverse effects on human health were detected from their emissions.

6.5 CONCLUSIONS AND RECOMMENDATIONS

6.5.1 Need for adequate training & education

It is recommended that a diverse pool of properly educated and skilled people be available for the Sound Management of Chemicals in the country.

It is noted that some organisations have been involved in imparting education and training to planters on the sound management of agrochemicals, mostly on pesticides and their empty containers. Consequently, the planter community is generally more aware about risks posed to their health and to the environment by over-utilisation of these products or unsound container management. It is however recommended that such type of training be also available for other types of chemicals for e.g. industrial chemicals.

Since third or fourth year students of Bachelor Degree programmes of relevant Faculties at the UoM undergo a brief training in the public or private sector, it can offer them a good opportunity to learn and be involved in aspects related to the Sound Management of Chemicals. It is recommended that such partnerships between UOM and hosts institutions be further strengthened.

6.5.2 Contribution of the private sector

In this respect, it recommended to have consultations with key stakeholders so as to increase the current fees for the trade permits and permits to use, sell, or store most harmful chemicals labelled as Extremely Dangerous Chemicals as per the DCCA. The proposed revision can be applicable for companies importing large amounts of such chemicals. It is expected that the private sector should make appropriate efforts in switching to environmental friendly alternatives, at a lesser expense for the trade of harmful chemicals, as part of their role for the Sound Management of Chemicals (SMC) at national level.

Many private sector companies using chemicals on a routine basis are represented by umbrella organisations such as the Mauritius Chamber of Commerce and Industry (MCCI), Association of Mauritian Manufacturers (AMM), Joint Economic Council (JCE), These organisations should be able to request their members for information on their activities concerning the management of chemicals, for e.g. new technologies being used, programmes for container management, any exports of chemical wastes or challenges faced for wastes disposals, labelling requirements of their manufactured goods. Eventually, such key information must be reported to Governmental authorities periodically.

It is also recommended that the private sector extends its assistance for the industrial hazards mapping exercise, using GIS, to be carried out by the NDRRMC with the collaboration of other key stakeholders. This would help to identify hot-spots such as bulk fuel depots, industrial units, incinerators, boiler houses, major warehouses of chemicals and other hazardous facilities across Mauritius.

Though stipulated in the OSHA, risk assessments for chemicals may not be efficiently undertaken in working environments due to a shortage of professionals versed in occupational toxicology or industrial hygiene. There is also a lack of proper equipment for the monitoring of area and personal contaminations and exposure to workers at risks. It is also recommended that there be uniformity in the approach adopted by all industries to conduct risks assessments at their ends. A common matrix to quantify and indicate the risks levels can be adopted while considering concentration or toxicity of the chemicals used to represent the severity factor and the duration or frequency to represent the time factor. As the private sector consists of major traders and users of chemicals, it is expected that it plays a more pro-active role for the Sound Management of Chemicals whereby it can assist relevant public authorities so as to promulgate a safe culture. It is recommended that private companies embark on responsible care programmes or extended users' responsibility programmes which can include activities like providing technical advice to clients on safe uses of chemicals, enabling proper collection and disposal of used chemical containers or engaging in community works in the society for rehabilitation of polluted areas or water bodies, etc.

6.5.3 More emphasis for research activities

As the amount of research work related to the Sound Management of Chemicals is quite low, more research ought to be conducted in Mauritius. To this end, it is recommended that the following listed institutions providing assistance as mentioned below:

- Ministry of Tertiary Education, Science Research and Technology for administrative & coordination purposes.
- Mauritius Research Council for administrative & funding purposes
- University of Mauritius, University of Technology Mauritius and the Mauritius Institute of Health, to provide researchers, research methodologies and other facilities.

6.5.4 Greater involvement of the Civil Society

Public involvement in matters pertaining to the Sound Management of Chemicals is quite low in Mauritius and awareness raising activities should therefore be encouraged. As noted there are very few NGOs involved in the entire mechanism of the Sound Management of Chemicals through their activities. In this context, it is suggested that additional NGOs be set up for the benefit of the Civil Society. It is also recommended that all NGOs make themselves more identifiable and provide information on their activities either through the MACOSS or another appropriate channel.

INTER-MINISTERIAL COORDINATING MECHANISMS FOR THE MANAGEMENT OF CHEMICALS

Few countries have set up a specialised agency or an institution dedicated for the management of chemicals. It is very common to find within a Government, several Ministries or public institutions having, within their mandates, some connection with chemical management, for instance the Ministry responsible for matters on agriculture will definitely have under its purview aspects pertaining to agricultural chemicals in its legislations, while the Health Ministry would have responsibilities towards the control of pharmaceutical substances. Likewise, specific public institutions are called upon to manage chemicals by unilateral concerns within their own specific mandates. It is also true that there would very few institutions be entrusted to manage chemicals at all the stages of their life-cycle which also explain the nature of unilateral concerns.

However to achieve the Sound Management of Chemicals, a multi-stakeholder approach is highly desirable. Being regulatory agencies, governmental institutions like Ministries must cooperate despite differences in their mandates. By gathering these public institutions in a common forum such as a ministerial commission or a specialised working group, better opportunities are created for them to share expertise and knowledge on several aspects pertaining to chemical management. With such think-tanks constituted, a wealth of information would be also available for other stakeholders like decision makers or policy specialists at national level. Furthermore, any development happening on the international front, such as new trade directives, newly prohibited chemicals or widening scope of MEAs would be easily implemented or integrated in the national context by existing coordinating mechanisms.

7.1 OVERVIEW OF INTER-MINISTERIAL COORDINATING MECHANISMS

Mauritius does not have a specialised independent agency to manage chemicals. It however does have two specific coordinating mechanisms for this purpose as established under the Dangerous Chemicals Control Act 2004. In addition, there are other inter-ministerial mechanisms existing under other legislations which do have some relevance to chemicals management, for instance environmental mechanisms. This Chapter will be describing relevant mechanisms that have been put in place so as to highlight the cooperation existing among stakeholders.

It must be stated that Mauritius being a small country, cooperation among stakeholders is highly important to develop an integrated approach in managing chemicals. Table 7.1 provides an overview of inter ministerial coordinating mechanisms.

Name of mechanism	Responsibilities	Secretariat	Chair-person & members	Objective /Legislative mandate	Further data given in Section 7.2	Effectiveness
Dangerous Chemicals Advisory Council	To advise the Minister responsible for Health on matters on chemicals.	Occupational Health Unit, MoHQL	22	Dangerous Chemicals Control Act 2004	Yes	Medium
Dangerous Chemicals Control Board	To manage chemicals throughout their life-cycle	Occupational Health Unit, MoHQL	17	Dangerous Chemicals Control Act 2004	Yes	High
Advisory Council on Occupational Safety & Health	To advise the Minister for Occupational Safety & Health matters.	Occupational Safety & Health Inspectorate, MoLIRE	27	Occupational Safety & Health Act 2005	No	High

MSB Chemical Standards Committee	To issue Mauritian Standards for consumer chemicals and industrial chemicals	Mauritius Standards Bureau, MoICCP	17	Mauritius Standards Bureau Act	No	High
National Pharmacovigilance Committee	To report on any adverse drug reactions from the public and private pharmacists.	Pharmacy Board, MoHQL	13	Pharmacy Act	No	High

7.1.1 Dangerous Chemicals Advisory Council (DCAC)

Established under the Dangerous Chemicals Control Act (DCCA) 2004, the Dangerous Chemicals Advisory Council (DCAC) is a coordinating committee consisting of 23 representatives including the Chairperson. The DCAC is mandated to perform the following:

- Advising and making recommendations to the Minister of Health on matters relating to dangerous chemicals.
- Advising the aforesaid Minister on the implementation of international conventions related to dangerous chemicals.
- Consulting and advising the DCCB on the DCCA 2004.

A Chairperson of the DCAC is appointed by the Minister who is responsible for health matters. The Chairperson must be at least a Principal Medical Officer in grade. The DCCB Registrar acts as Secretary for the committee and the composition of the DCAC is as given in the Table 7.2 shown below:

Table 7.2: Composition of the DCAC
The Chairperson, as appointed by the Minister
A representative of the Attorney General's Office
A representative of the Ministry responsible for the subject of agriculture
A representative of the Ministry responsible for the subject of commerce and cooperatives
A representative of the Ministry responsible for the subject of environment
A representative of the Ministry responsible for the subject of industry, financial services and corporate affairs
A representative of the Ministry responsible for the subject of labour and industrial relations
A representative of the Ministry responsible for the subject of public infrastructure, land transport and shipping
A representative of the Ministry responsible for the subject of local government
The Director of Pharmaceutical Services of the Ministry responsible for the subject of health
A representative of the Commissioner of Police
A representative of the Customs Department
A representative of the Government Fire and Rescue Services
A representative of the Forensic Science Laboratory
A representative of the University of Mauritius
A representative of the Mauritius Chamber of Commerce and Industry
A representative of the Mauritius Ports Authority
A representative of the vegetables growers' association who shall be responsible for the subject of co-operatives
A representative of the Health & Safety Officers' Association as appointed by the Minister
Three members of the public having knowledge in chemicals as appointed by the Minister

Source: DCCA 2004

7.1.2 Dangerous Chemicals Control Board (DCCB)

The Dangerous Chemicals Control Board (DCCB) is the next coordinating mechanism dealing with chemicals management in Mauritius. It is also established under the DCCA and has a secretariat at the Occupational Health Unit of the Ministry of Health & Quality of Life.

In accordance to the DCCA, a Chairperson and 16 members constitute the DCCB as described in the Table 7.3. Alike for the DCAC meetings, the DCCB Registrar acts as the Secretary to the Board meetings which are held on a monthly basis.

Table 7.3: Composition of the DCCB
Chairperson : Head of the Occupational Health Unit of the MoHQL
A representative of the Ministry responsible for the subject of labour and industrial relations
A representative of the Ministry responsible for the subject of environment
A representative of the Ministry responsible for the subject of local government
The Chief Government Analyst
The Principal Research and Development Officer (Entomology) of the Ministry responsible for the subject of agriculture
The Principal Research and Development Officer (Agricultural chemistry) of the Ministry responsible for the subject of agriculture
The Principal Research and Development Officer (Plant Pathology) of the Ministry responsible for the subject of agriculture
A Government Pharmacist appointed by the Minister responsible for Health
A representative of the Mauritius Cane Industry Authority
A representative of the Mauritius Chamber of Agriculture
A representative of the Central Water Authority
A representative of the Mauritius Standard Bureau
A representative of the Agricultural Research and Extension Unit
A representative of the Chief Health Inspector of the Ministry responsible for Health
A representative of the Commissioner of Police
A representative of the Fire and Rescue Services

Source : DCCA 2004

7.1.3 Role of the DCCB

The functions of the DCCB as described by the DCCA are to:

- Classify dangerous chemicals in accordance with the Fifth Schedule, after consultation with the DCAC;
- Disseminate to other law enforcement agencies and public departments information relating to dangerous chemicals;
- Ensure co-ordination and co-operation amongst the law enforcement agencies, government departments and other institutions for the effective control of dangerous chemicals;
- Develop such policies and administrative measures as are necessary to ensure prompt and effective consultation on matters relating to dangerous chemicals;
- Consider applications for the grant of licences, permits and authorisations under the DCCA;
- Issue any prohibition notice for offences;
- Consider any request for the advertisement of a dangerous chemical after consultation with the DCAC;
- Register dangerous chemicals in such manner as may be prescribed;
- Carry out such other duties as may be necessary for the control of dangerous chemicals.

As mentioned in Chapter 4, the main committee of the DCCB has also established three technical sub-committees comprising of the above members to look into specific matters pertaining to three different categories of chemicals. They are the Agricultural chemicals, Industrial chemicals and Consumer chemicals. Each sub-committee meets on a monthly or bi-monthly basis and makes their recommendations to the main committee of the DCCB.

7.1.4 Achievements of the DCCB

Since its creation in 2004, the DCCB has had various contributions in the management of chemicals in Mauritius. Some of these contributions represent major achievements considering the benefits earned by recommendations made on chemicals at national levels. A description of these achievements is given in Table 7.4 below.

Table 7.4: Achievements of the DCCB		
Action/Contribution	Effect	Benefit(s)
National Plan of Action on Asbestos & the creation of an Asbestos Secretariat at the OHU	Strengthening the Addison Report (2001)	Measurements for fibre counts from buildings, houses, etc. have shown that asbestos is not a major source of worry in Mauritius.
Regulatory control of Ammonium Nitrate imports	Misuses of this chemical prevented	Illegal manufacture of explosives hindered
Regulatory control of Nonylphenols (toxic organic compounds) which may be used in commodity products	Risk of contamination is lowered	Better management of toxic chemicals
Imports of batteries with 0% Mercury, toxic heavy metal	Risk of contamination is lowered	Better management of toxic chemical
Shift from liquid to solid (granular) formulation for herbicides	All herbicides now imported in recyclable plastic packs.	<ul style="list-style-type: none"> Importers are spending less due to a reduction of the volume of freight. Burden of managing empty containers is no more existent.
Strict regulatory controls for importing & selling the insecticide Paraquat	Only 1 500 litres/importer allowed in 2013 and sales restricted to 'registered planters only.	Number of cases of suicides due to Paraquat dropped significantly
Banning and removal of all carcinogenic pesticides.	Pesticides now imported as per list from the World Health Organisation.	In line with international regulatory control mechanism
Design of labels for containers of agrochemicals to be used locally.	Importers directed to display officially approved labels only.	Information contained on the labels include: <ul style="list-style-type: none"> Risks to health Safety measures Local names of crops that the product is intended for. Pre-harvest time Types of weeds or pests controlled.

¹Registration with Small Planters Welfare Fund (SPWF), Farmers Service Centre (FSC) or MCIA

By convention, a colour code is applied to indicate the relative toxicity of the pesticide which are put on sale on the borders of the its container label as follows:



An example of such a label for a herbicide, wherein pictograms have been omitted, is given in Figure 7.1. It can be noted that the names of local crops on which the herbicide must be applied have been mentioned in Creole language for the easy understanding by a maximum number of planters as well as for the laymen

Figure 7.1: Label for Herbicide



7.1.5 Enforcement Agencies

As per the Third Schedule of the DCCA, the Board is the main enforcing agency for the overall planning and coordination to enforce the said Act. There are seven other Enforcing Agencies each with specifically defined roles as given in the table below:

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Table 7.5: Enforcing Agencies and their responsibilities	
Enforcing Agency	Responsibilities
DCCB	<ul style="list-style-type: none"> • Planning and coordination of the enforcement as a whole, the granting of import permits and licences, notification, information or educational programme or the keeping of any register.
Ministry responsible for the issues for Labour and Industrial relations	<ul style="list-style-type: none"> • Ensuring the professional use, at place of work, of dangerous chemicals, by the Occupational Safety and Health Inspectorate. • Inspection, investigation and audit of the use of dangerous chemicals at a place of work. • Perform risk analysis and assessment further to loss of containment or explosion of dangerous chemicals.
Ministry responsible for Health	<ul style="list-style-type: none"> • Informing of adverse effects on humans likely to be caused by dangerous chemicals. • Perform inspection and control on medical surveillance and regular examinations. • Investigate and evaluate occupational diseases or work related disease following exposure to or use of dangerous chemicals.
Ministry responsible for Environment	<ul style="list-style-type: none"> • Informing of the adverse effects on the environment likely to be caused by dangerous chemicals.
Ministry responsible for Local Government	<ul style="list-style-type: none"> • Collection, storage, treatment and disposal of hazardous waste.
The Mauritius Police Force	<ul style="list-style-type: none"> • Transport by road of dangerous chemicals and emergency planning. • Training of drivers involved in the transport of dangerous chemicals. • Undertake rescue activities further to an accident where dangerous chemicals may pose a threat to humans, animals or the environment
The Mauritius Fire and Rescue Services	<ul style="list-style-type: none"> • Take action with respect to spreading of dangerous gases, vapours, fumes, aerosols, explosions and fires, spillage of dangerous chemicals and emergency planning. • Issue fire clearances and enforcement of fire safety measures in respect of storage, use and transport of dangerous chemicals. • Take necessary action in case of loss of containment of dangerous chemicals
Ministry responsible for Agriculture	<ul style="list-style-type: none"> • Ensuring proper and safe use of pesticides by farmers, control of pesticides residues on vegetables and fruits.
Customs Department	<ul style="list-style-type: none"> • Record statistics on nature and amount of dangerous chemicals imported • Record statistics on the export of dangerous chemicals including transits • Assist the Board by exchanging computerized information relating to the importation of dangerous chemicals.

During the discharge of their duties in the enforcement of the DCCA, the enforcing agencies listed in Table 7.5 through their delegated officers) are also mandated to:

- Verify compliance with the said Act;
- Conduct inspections, monitoring, sampling and testing as required to ensure compliance with the Act;
- Provide assistance for assessing classification, labelling, safety data sheets and substitution and intervene as required in case of a spill or emergency involving dangerous chemicals;
- Carry out directions issued by the Minister on the recommendations of the DCC Advisory Council;
- Keep record of all inspections, compliance monitoring exercises and information obtained and provide same upon request by the Board;
- Report at earliest to the Board any contravention to the said Act.

7.2 CONCLUSIONS AND RECOMMENDATIONS

7.2.1 Review of the Coordination Mechanisms under DCCA

Both the DCAC and the DCCB are comprised of delegated members from diverse Ministries and other stakeholders who are called upon to liberate themselves from their routine duties and responsibilities to attend meetings, inspections or other official deliberations on the Sound Management of Chemicals (SMC) in Mauritius. In this respect, with the establishment of a dedicated authority for SMC, permanent staff of the proposed institution will be available to handle SMC related responsibilities and tasks.

The Dangerous Chemicals Control Act also mentions the existence of an Enforcing Agencies Coordinating Committee (EACC) however, no meetings of this mechanism are currently held. It is proposed that the constitution of the EACC could be modified to incorporate representatives of industry groups, workers' groups, the civil society, consumers' associations or women's associations in addition to the technical stakeholders which would normally form part of it.

Deliberations of the DCCB and the DCAC meetings may not always be known to all stakeholders involved in managing chemicals or the public. It is suggested that any major decisions taken on SMC aspects be disseminated in national interest and for better transparency.

7.2.2 More emphasis on coordination mechanisms for SMC

The MID Commission which developed from an Inter-Ministerial Coordination Mechanism has so far considered only agro-chemicals in its mandate, while other categories of chemicals have not received its consideration. It is recommended that this situation be revised as other sectors of the economy are also vital for the sustainable development of the Republic of Mauritius.

Chapter 8

NATIONAL DATA AND INTERNATIONAL LINKAGES FOR THE MANAGEMENT OF CHEMICALS

Several stakeholders are called upon to deal with chemicals and chemicals-related issues either through official mandates or voluntarily. Based on their activities, these stakeholders may record data on chemicals as per own systems and may eventually share this data with other stakeholders. Consequently, the entire process of chemicals management needs to give consideration to the data available and the accessibility to obtain and use of same. Moreover, data emanating from international sources as a result of activities on chemicals must also be considered as helpful. For instance, lessons learnt from any previous accidents or improvements due to practices introduced for the management of chemicals.

The United Nations and its specialised agencies have put forward Protocols, Conventions or Regulations for instance the Multilateral Environmental Agreements (MEAs) in the light of the challenges posed by chemicals. One of the strong reasons for the development of such international mechanisms is the intricate relationship between impacts on health and environment and the unsound uses or poor management of chemicals. These international regulating mechanisms have indeed fostered cooperation among countries while also providing various kinds of assistance to individual countries or regional blocks. They are also aimed at promulgating the concept of harmonisation within the various aspects of chemical management. Accordingly, by adhering to such international mechanisms, countries must keep proper records of its obligations, activities undertaken or assistance received.

8.1 AVAILABILITY OF DATA FOR CHEMICAL MANAGEMENT

The Ministries within the Republic of Mauritius all possess their own dedicated sections which gather and distribute official data either through a Resource Centre or through via online services. All other public agencies such as parastatal institutions are called upon to do the same. These are supplemented by Statistics Mauritius, a department under the Ministry of Finance and Economic Development. Data which can be both qualitative and quantitative is required for decision-makers at governmental level especially when introducing or reviewing legislations pertaining to chemicals.

In Table 8.1 the type of available data from various stakeholders is shown for pesticides, industrial chemicals and consumer chemicals as well as chemical wastes.

Table 8.1: Available data on selected chemical categories and chemical wastes

Data needed for/to	Pesticides (agricultural, public health and consumer use)	Industrial Chemicals	Consumer Chemicals	Chemical wastes
Priority setting	Priority Setting conducted in September 2013 Data in process.	Priority Setting conducted in September 2013 Data in process.	Priority Setting conducted in September 2013 Data in process.	Priority Setting conducted in September 2013 Data in process.
Assess impact of chemicals under local conditions	Data only available for agricultural pesticides as a result of efficacy trials.	May be undertaken at user level but no available data at national level	Not available	Not available
Risk assessment (environment / health)	Data only available for agricultural pesticides as a result of efficacy trials on local crops.	May be undertaken at user level but no available data at national level	May be undertaken at user level but no available data at national level	May be undertaken at user level but no available data at national level
Classification	Data available at DCCB Secretariat	Data available at DCCB Secretariat	Data available at DCCB Secretariat	Not available
Registration	Data available at DCCB Secretariat	Data available at DCCB Secretariat	Data available at DCCB Secretariat	Data available at MoLGOI
Licensing	Data available at DCCB Secretariat	Data available at DCCB Secretariat	Data available at DCCB Secretariat	Data available at MoLGOI
Permitting	Data available at DCCB Secretariat			
Risk reduction decisions	Data available at DCCB Secretariat			
Accident preparedness Response	No data	Under development	No data	Under development
Poisoning control	Data available for agricultural pesticides at DCCB Secretariat		Some data available after cases of accidental poisoning	No data
Emission inventories	Not applicable	Data available for inspections conducted by the MoESD	Not applicable	Data available for inspections conducted by the MoESD
Inspections & audits (Environment / health)	Data available for licensing inspections conducted by the DCCB and its enforcing agencies	Data available for licensing inspections conducted by the DCCB and its enforcing Agencies	Data available for licensing inspections conducted by the DCCB and its enforcing agencies	
Information to workers	Data available for training sessions carried out by the MoLIRE & DCCB	Data available for training sessions carried out MoLIRE & DCCB	Data available for training sessions carried out	Data available for training sessions carried out
Information to public	Data available for awareness sessions carried out by AREU, MCIA & NGOs		Not applicable	

8.2 LOCATION OF NATIONAL DATA

In Mauritius, the main source of national data is Statistics Mauritius (SM), which operates under the aegis of the Ministry of Finance & Economic Development. SM gathers data from all national stakeholders and generates statistical analysis and trends. These data are accordingly published in Monthly Reports, Annual Reports, Periodicals and Digests, which can be accessed both in hard copies and soft copies. In Mauritius, access to the internet is not restricted.

Table 8.2: Location of national data related to chemicals					
Type of data	Location	Data Source	Accessibility	How to gain access?	Format
Production statistics	Statistics Mauritius	CD	Anybody	Published on the internet (www.statsmauriti.us.gov.mu)	Microsoft Office Word & Excel
Import statistics	Statistics Mauritius	CD	Anybody	Published on the internet (www.statsmauriti.us.gov.mu)	Microsoft Office Word & Excel
Export statistics	Statistics Mauritius	CED/DCCB	Anybody	Published on the internet (www.statsmauriti.us.gov.mu)	Microsoft Office Word & Excel
Industrial accidents reports	Occupational Safety and Health Inspectorate, MoLIRE	Records from employers' facilities, Labour Offices	Limited	Official request	Microsoft Office Word
Transport accidents reports	Traffic Branch, MPF	Police Stations	Limited and may be confidential	Official request	Hand written in Occurrence Book
Occupational Health data: Agriculture	OHU	Records from hospitals, AHCs or private health facilities	Limited	Published on the internet (www.healthstats.mu)	PDF file
Occupational Health data: Industrial	OHU	Records from hospitals, AHCs, private health or facilities	Limited	Published on the internet (www.healthstats.mu)	PDF file
Poisoning statistics	Health statistics Report	DCCB, GAD, FSL	Limited and may be confidential	Published on the internet (www.healthstats.mu)	PDF file
Pollutant release and transfer register	Pollution Prevention and Control Division, MoESD	MoESD	Limited	Official request	Microsoft Office Word
Hazardous waste data	Hazardous waste Inventories	Hazardous wastes contractors, MoLGOI	Anybody	Published on the internet	PDF file
Register of pesticides	DCCB Secretariat	Data given in the official application form (Annex 4)	Limited	Official request	Hand written
Register of Toxic chemicals	Not available	Not available	Not available	Not available	Not available
Inventory of existing chemicals	Not available	Not available	Not available	Not available	Not available
Register of imports	CD	CD	Limited	Official request	Hand written
PIC Decisions	DCCB Secretariat		Limited	Official request	

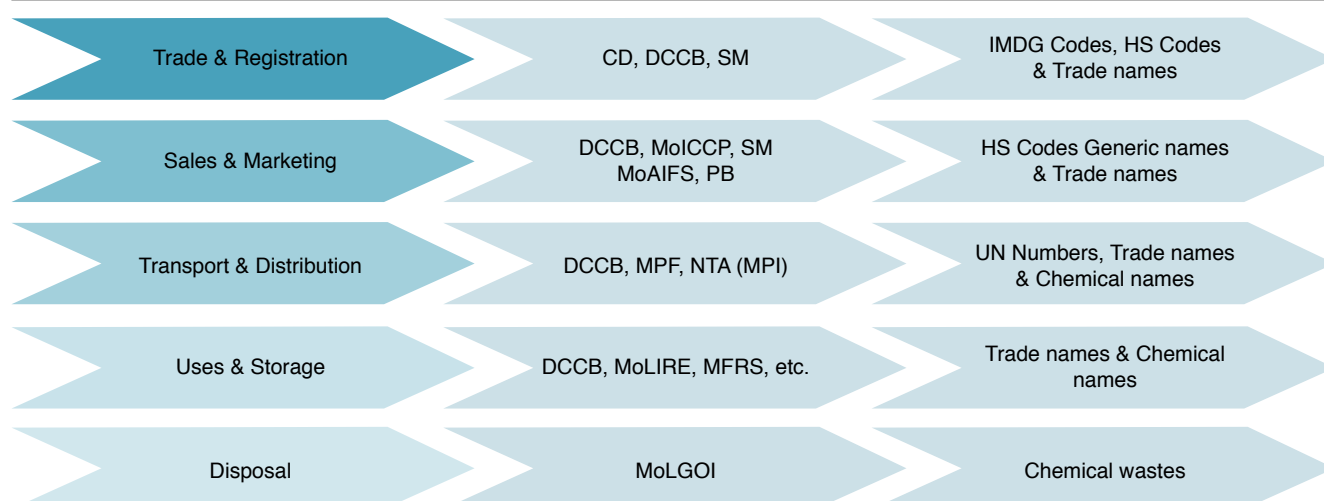
In general, data about chemicals is generated, stored and used by various regulatory stakeholders for different purposes. However, the ways in which national data is stored, used, updated, maintained and shared with stakeholders for eventual purposes must be improved. One good illustration to strengthen the needs for such data is for the introduction or reinforcement of relevant legislation and standards. For instance, in order to set permissible limits of chemical pollutants in waters, effluents, air emissions or pesticide residues in foods, quantitative data must be readily available.

Another area for improvement is to harmonise the data from stakeholders via a centralised system which can be easily accessible for all approved stakeholders. It has been mentioned earlier that the Tradenet system devised by the Customs Department (CD) links other national enforcing agencies, which happens to the DCCB for the trade of chemicals. In this respect, all stakeholders can be linked together on a single chemicals portal hosted by the DCCB or another new centralised department under Statistics Mauritius. It would definitely be beneficial for stakeholders and decision makers to have computerised data.

Moreover, information on chemicals can be harmonised by the use of a quick identification system for e.g. through the use of Chemical Abstract Service (CAS) numbers, which are internationally approved numbers to identify chemicals. Each chemical substance has a unique CAS number which is usually mentioned in the substance's Safety Data Sheet (SDS) and available from trading stage.

Figure 8.1 below depicts the relationship between key stakeholders and type of information which they normally use, to identify chemicals through the different stages of the life cycle of chemicals.

Figure 8.1: Identification of chemicals throughout their life cycle



8.3 INTERNATIONAL COMMITMENTS ON THE MANAGEMENT OF CHEMICALS

Mauritius is party to a number of international conventions and treaties e.g. the adhesion of the country to the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Basel Convention on Trans-boundary Movements of Hazardous Wastes were already highlighted.

8.3.1 Membership of International Organisations

The Ministry of Foreign Affairs, Regional Integration and International Trade keeps a record of all treaties and organisations to which Mauritius is a party. However, in terms of Chemicals Management information on focal points and ongoing programmes is harder to obtain, as the records are found at the relevant Ministries. Table 8.3 below shows a list of International Organisations, and certain related national activities in relation to chemicals management.

Table 8.3: Membership in International Organisations, Programmes and Bodies

International Organization/Body/Activity	National Focal Point	Other Ministries/Agencies involved	Related national activities
International Forum on Chemical Safety (IFCS)	MoH&QL	DCCB	
UNEP IE/TAC – Cleaner Production Center	MoESD	MoICCP, MoEPU	
IPCS	MoH&QL		
WHO	MoH&QL	DCCB	
FAO	MoAIFS	AREU/FARC, DCCB, NPPO	
UNIDO	Industry Division MoICCP	MSB	Sustainable Consumption Programme
ILO	MoLIRE	MoHQL, MoSSRI	Decent work Programme
UNFCCC	MEPU	PMO	
UNESCO	MoE&HR		
OPCW	PMO	FSL, CTU	
IAEA	RPA, MoEPU	MoICCP	
World Bank	MoFED		
World Customs Organisation	MoFED	CD, DCCB	
African Development Bank	MoFED		
African Union	MoFARIIT		

Table 8.4 shows the main international regulatory mechanisms adopted on for the management of chemicals and to which Mauritius has adhered.

Table 8.4: Commitments with international Agreements related to the SMC			
International Agreements	Primary Responsible Institution	Accession (A)/Ratification (R) /Signing (S) date as applied	Related national implementation activities (if any)
Vienna Convention on the protection of the Ozone layer	MoESD	18.08.1992 (A)	
Montreal Protocol on ODS	MoESD	18.08.1992 (A)	
Kyoto Protocol to the Convention of Climate Change	MoESD	09.05.2001 (R)	
Prevention of pollution from ships (MARPOL)	MoPI	06.04.1995 (R)	
Convention for safety of life at sea (SOLAS)	MoPI	01.02.1988 (A)	
UNCLOS	MoPI	04.11.1994 (R)	
Basel Convention on Control of Transboundary movements of Hazardous wastes	MoLGOI	24.11.1992 (R)	Hazardous Wastes Inventory Report 2012
Bamako Convention on the ban of imports and the control of transboundary movements of hazardous wastes into Africa	MoLGOI	Nov. 1992 (R)	
Rotterdam Convention on PIC procedure for international trade of hazardous chemicals and pesticides	MoHQL	03.08.2005 (S)	
Stockholm Convention on POPs	MoESD & MoHQL	05.07.2004 (R)	<ul style="list-style-type: none"> National Implementation Plan on POPs, 2005 Sustainable Management of POPs, 2009 Alternatives to DDT for vector control, 2009
Convention on Early Notification of a Nuclear Assistance	RPA (MoEPU)	17.09.1992 (A)	
Convention on Assistance in case of a Nuclear Assistance or Radiological Emergency	RPA (MoEPU)	17.09.1992 (A)	
African Regional Cooperative Agreement for R & D and Training related to Nuclear Science & Technology	RPA (MoEPU)	26.04.2000 (A)	
Cartagena Protocol on Biosafety	MoAIFS	09.05.2001 (R)	
SAICM	MoHQL	Focal point appointed in 2006 (non-binding)	<ul style="list-style-type: none"> National Chemical Profile. Mainstreaming Road Map SAICM Initiative, 2013 - 2014 Mercury Action Plan 2014
Chemical Weapons Convention	PMO	09.02.1993 (R)	Setting up of the Counter Terrorism Unit
Codex Alimentarius	MoHQL/MoAIFS		
UN Convention on the illicit traffic in narcotic drugs and psychotropic substances	MoHQL	06.03.2001 (A)	
Nairobi Convention	MoESD	10.07.2000 (A)	<ul style="list-style-type: none"> Protocol on Land-Based Sources and Activities (LBSA), 2008
Minamata Convention	MoESD	10.10.2013 (S)	<ul style="list-style-type: none"> Mercury Emissions Level 1 Inventory National Actionplus on Mercury

8.4 CONCLUSIONS AND RECOMMENDATIONS

8.4.1 Greater emphasis on data management

Further to the creation of the Data Protection Office in Mauritius, all public institutions have shown a sense of responsibility towards the management of data including information related to chemicals. However, due to a lack of resources, in terms of personnel and logistics, the DCCB and the DCAC do not publish any information either on its website or through other means on the sound management of chemicals in Mauritius. As recommended before, the availability of such data would be important for decision makers.

With many new development plans to transform the Republic of Mauritius into a regional hub for business, investments, tourism and other sectors, it is important to keep adequate databases as regards chemical management. Such information would be useful as and when required for the benefit of groups such as policy makers, researchers, planters, industry workers, or simply, the public at large.

The intended outcomes for the data generated on chemicals include research work, epidemiological studies, determination of environmental quality, and implementation of health and safety guidelines, making of economic analyses in respect of trade or the formulation of public health policies. It is recommended that such data be disseminated to enable any studies related to the above-mentioned fields, to obtain all official figures with less hassles.

All governmental institutions must keep proper records of information pertaining to chemicals. The ways in which information are recorded and reported must be reviewed. It is recommended that there be a unit based at Statistics Mauritius for data collection for all matters pertaining to chemicals.

In order to obtain, process and update statistical data on chemicals, it is also suggested that officers of Statistics Mauritius be posted on temporary basis or be called upon to visit each key Ministry and para-statal institution i.e. all governmental institutions, in order to facilitate the process of gathering data concerning use of chemicals. The designated officers must also verify that data is available in a harmonised manner.

8.4.2 Underpinning international commitments

Mauritius is a signatory of various international Conventions or Agreements to manage chemicals in a sound manner. In order to increase awareness around those conventions, it is recommended that relevant information be disseminated by Governmental authorities to achieve the following objectives:

- Unsound practices would be prevented, for instance in respect of the situation whereby local companies or individuals wish to import or export hazardous chemicals.
- The local population would be able adapt to their businesses, policies and mindsets within the scope of such mechanisms.

It is also recommended that relevant legislation be amended in connection with new developments in the international Conventions or Agreements for instance new chemicals facing regulatory controls or bans.

Chapter 9

TECHNICAL INFRASTRUCTURE FOR THE MANAGEMENT OF CHEMICALS

This Chapter deals with the scientific and technical infrastructure present in Mauritius in connection with the sound management of chemicals within its territories. A pre-requisite for the sound management of chemicals is the availability of appropriately qualified and trained human resources having the right knowledge and skills. This chapter therefore deals with the laboratory infrastructure and the technical/academic ones.

9.1 OVERVIEW OF AVAILABLE LABORATORY INFRASTRUCTURE

As may be expected, there are different types of scientific laboratories which exist in the Republic of Mauritius. Some of these laboratories are directly related to chemicals, for instance those ones undertaking the testing of water, foodstuffs, air, manufactured products, etc. and a few ones involved in research work though minimal. The laboratories are themselves consumers of chemicals on a routine basis and employ them in their original states or as mixtures commonly called reagents in laboratory jargon. The reagents can either be prepared in-house by the laboratory staff using the chemicals as starting substances or can be procured as manufacturers of chemicals also provide ready-made ones.

Laboratory chemicals are imported by a few local suppliers who are registered with the DCCB. None of these companies is equipped with their own laboratories to test the chemicals under local conditions, before any delivery is made. However, the suppliers have to furnish their clients with Safety Data Sheets (SDS) and certificates of analysis emanating from the original manufacturers for these chemicals.

Laboratory chemicals and reagent solutions are commercially available under different grades. This grading system is based on the purity of the chemicals at the time of manufacture. The more refined chemicals are used by the more sophisticated testing equipment which often comprises of more than one analytical technique thereby generating results in parts per billion or lower order of sensitivity. For instance, the Gas Chromatography-Mass Spectrometry (GCMS) is a combination of two different analytical techniques employed using a single assembly of equipment, for the detection of pesticides or other organic chemicals. However, the more refined laboratory chemicals are, the more expensive they would be. Moreover, these testing chemicals are usually supplied in smaller pack sizes at source. For example a 1ml vial of Certified Reference Material (CRM), containing a single pesticide required for analysis may be available as from US \$ 50. Consequently, these chemicals represent a very significant figure in the daily running cost of analytical laboratories, a situation which hinders a developing country like Mauritius to undertake testing on a routine basis.

Moreover, as the active ingredients in different types of chemicals change with time, new CRMs and other laboratory calibration standards developed by manufacturers must be employed during analysis to increase traceability of the intended analytes,

thereby improving the competence of the testing laboratories. Another level of constraint lies with the maintenance of the testing and calibration equipment available at the local laboratories. Usually, they do not employ staff with specific skills to successfully attend equipment breakdowns or perform change of sensitive spare parts. Unfortunately, the laboratories often find themselves with faulty equipment for long periods of time during which no testing can be conducted or done with reduced efficiency. At times, such scenarios may necessitate interventions from the original equipment manufacturers since the local agents do not have the right solutions to attend to such challenges. Consequently, the local chemical testing laboratories in the Republic of Mauritius are quite constrained in terms of adequacy of resources enabling them to perform efficiently.

The classification hereunder shows the main types of laboratories which exist in Mauritius:

- Public sector laboratories
 - > Analytical laboratories under the direct responsibility of a Ministry.
 - > Analytical laboratories under the direct responsibility of a para-statal organisation.
 - > Research laboratories under the direct responsibility of public or para-statal organisations.

- Private sector laboratories
 - > Analytical or Research laboratories within quality or production units of private companies.
 - > Analytical laboratories operated by on-site contractors.
 - > Analytical laboratories which contract their services at their own facilities

- Research & academic laboratories
 - > Laboratories for educational or research purposes for tertiary-level educational institutions.
 - > Laboratories for educational purposes for secondary-level educational institutions.
 - > Laboratories of research institutes.

In addition to the chemical laboratories, there are also a few scientific and technical laboratories which also use chemical substances during their routine work, for instance, the medical testing laboratories whether attached to the public hospitals, clinics or operating in private, which undertake routine testing of biological specimens for example, microbiological laboratories conduct tests on bacteria and viruses and material testing laboratories perform solvent extractions of bituminous road-building materials at their facilities.

As seen earlier, there is a lack of adequate disposal facilities for hazardous wastes and the testing laboratories face the same problems of storing wastes at their own premises. Laboratory wastes may be toxic if harmful chemicals were originally present in the reagents, solutions or other materials used, such as measuring devices containing mercury or equipment parts containing cadmium, etc.

9.1.1 Chemical laboratories in the public sector

The main public organisations involved in SMC related activities in Mauritius i.e. Ministries, parastatal bodies, research institutes and tertiary academic institutions are equipped with appropriate laboratories. Their specific routine tasks may involve similar activities such as sampling and monitoring, sample processing, analytical testing etc. These laboratories may interact with one another, for instance, within the scope of common national projects.

The public laboratories may not always be located near to the responsible institutions which manage them. There is also little official cooperation between laboratories in terms of sharing of resources obtained from their respective managerial organisations. The case of the National Laboratories Complex (NLC) is quite interesting, since it actually houses four laboratories, each from a different parent Ministry, i.e. with a different set of responsibilities in one common building. Chapter 11 provides more details on the resources allocated to the public laboratories.

With the exception of academic and research laboratories, most of them are called upon to conduct chemical testing works so as to verify compliance with standards and regulations of applicable legislations. Accordingly, they form part of advisory and decision-making processes of their own Ministries or in inter-ministerial mechanisms. Results generated by these laboratories are further used by other scientific professionals such as doctors, engineers, agronomists, hydrologists, etc. Representatives of a few of these laboratories may also be summoned in a court of law to defend the validity of their methodology or results of analysis.

Table 9.1 below gives a description of the available laboratory infrastructure within the public sector in Mauritius, including the UoM.

Table 9.1: Description of Governmental Laboratories in Mauritius					
Parental Organisation	Responsible department	Name of laboratory	Location	Sections/Subsidiary labs	Routine tasks conducted
Ministry of Health & Quality of Life	Health Services	Government Analyst Division (GAD)	NLC, Reduit	<ul style="list-style-type: none"> • Food Analysis • Instrumentation • Toxicology • Pharmacy 	<ul style="list-style-type: none"> • In-house testing of samples • Issue of Pre-market Approval Permits and other certificates • Testing of blood-Cholinesterase activity for workers
Ministry of Environment & Sustainable Development	Department of Environment	National Environmental Laboratory (NEL)	NLC, Reduit	<ul style="list-style-type: none"> • Trace metals • Organic • Wet Chemistry • Microbiology • Ambient air monitoring 	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing
Ministry of Agro Industry and Food Security	Mauritius Cane Industry Authority (MCIA)	Agricultural Chemistry Department	MCIA Compound Reduit	<ul style="list-style-type: none"> • Chemistry 	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing • Research
Ministry of Agro Industry and Food Security (MoAIFS)	Agricultural Services	Agricultural Chemistry Division (ACD)	MoAIFS Reduit	n/a	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing
Ministry of Agro Industry and Food Security (MoAIFS)	Agricultural Services	Food Technology Laboratory (FTL)	MoAIFS Reduit	n/a	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing
Ministry of Agro Industry and Food Security (MoAIFS)	Entomology Division	Entomology Laboratory	MoAIFS Reduit	n/a	<ul style="list-style-type: none"> • Sampling & site-visits • Field-testing • In-house testing • Research
Ministry of Agro Industry and Food Security (MoAIFS)	Agricultural Research Extension Unit (AREU)	Plant Pathology Laboratory	AREU Reduit	n/a	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing • Research

Ministry of Industry, Commerce & Consumer Protection	Industry Division	Mauritius Standards Bureau (MSB) Laboratories	MSB Moka	<ul style="list-style-type: none"> • Chemical Technology • Food & Agriculture • Food Microbiology • Fibre Technology • Civil Engineering • Mechanical Engineering • Electrical & Electronics • Engineering • Non-Destructive Testing • Metrology 	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing • Calibration of lab equipment • Conformity Assessment
Ministry of Industry, Commerce & Consumer Protection	Legal Metrology Department	Legal Metrology Laboratory	Bell Village	n/a	<ul style="list-style-type: none"> • Calibration of lab. equipment
Ministry of Energy and Public Utilities	Central Water Authority	CWA Laboratory	CWA Head Office, St Paul	<ul style="list-style-type: none"> • Water Quality Lab. • Pollution Control Lab. • Quality Control Lab. 	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing
Ministry of Energy and Public Utilities	Wastewater Management Authority (WMA)	WMA Laboratory	NLC, Reduit	Chemistry Lab. Microbiology section	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing
Prime Minister's Office	Home Affairs Department	Forensic Science Laboratory (FSL)	NLC, Reduit	<ul style="list-style-type: none"> • Chemistry section • Biology section 	<ul style="list-style-type: none"> • Sampling & site-visits • Visits to scenes of crimes • Field-testing • In-house testing • Court cases
Ministry of Industry, Commerce & Consumer Protection	Industry Division	Assay Office	Ken Lee Tower Port Louis	<ul style="list-style-type: none"> • Assay Lab. • Gemmology Lab 	<ul style="list-style-type: none"> • Site-visits • In-house testing for alloys & jewellery • Gemstone identification • Grading of Diamonds
Ministry of Fisheries	Fisheries Division	Albion Fisheries Research Centre (AFRC)	Albion sea face	<ul style="list-style-type: none"> • Marine Chemistry • Marine Microbiology • Fish Toxicity 	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing
University of Mauritius (UoM)	Faculty of Science	Department of Chemistry labs	UoM, Reduit	• Chemistry Lab.	<ul style="list-style-type: none"> • Academic purposes • Research purposes
University of Mauritius (UoM)	Faculty of Engineering	Department of Chemical Engineering labs	UoM, Reduit	• Chemistry Lab.	<ul style="list-style-type: none"> • Academic purposes • Research purposes
University of Mauritius (UoM)	Faculty of Agriculture	Department of Agriculture labs	UoM, Reduit	• Chemistry Lab.	<ul style="list-style-type: none"> • Academic purposes • Research purposes
University of Mauritius (UoM)	Faculty of Science	Centre for Biomedical and Biomaterials Research (CBBR)	MCI, Reduit	• Chemistry Lab.	<ul style="list-style-type: none"> • Sampling & site-visits • On-site monitoring of parameters • Field-testing • In-house testing • Research

9.1.2 Technical capacities of public laboratories

Public sector laboratories provide analytical services to stakeholders based on their expertise. For the validity of their laboratory results by any client or third party, governmental laboratories have been encouraged to become accredited to internationally recognised standards. Therefore, the Government of Mauritius has developed a framework under the Ministry of Industry, Commerce and Consumer Protection, for the process of laboratory accreditation through the creation of the Mauritius Accreditation Service, MAURITAS which is responsible for the granting accreditation status to testing and calibration laboratories as well as for certification and inspection bodies. It has been actively involved for creating consciousness towards accreditation since its creation. Both public and private sector laboratories can be accredited by MAURITAS, in view of making their services internationally accepted and their competencies recognised in specific areas.

More than ten chemical laboratories falling under different Ministries and para-statal organisations have already been accredited to the ISO/IEC 17025:2005 Standards for Calibration and Testing Laboratories by MAURITAS. To achieve accreditation status for their capacities, these organisations have to be visited by the staff or contracted experts from MAURITAS for inspections, audits and surveillances audits. It must be noted that accreditation can be temporarily suspended or revoked in cases of deviations to conformances identified in post surveillance audits. MAURITAS has also been involved in arranging training activities on specific topics which include testing and calibration laboratories.

Table 9.2 provides further details on the technical capacities of the public laboratories. The description is only limited for public laboratories undertaking chemical testing and calibration, though many of them also perform other types of testing for instance, microbiological testing.

Table 9.2: Technical Capacity of Governmental laboratories for chemical analysis			
Laboratory	Types of samples tested	Main Analytical equipment	¹ Accredited tests/parameters
Government Analyst Division (GAD), MoHQL	<ul style="list-style-type: none"> • Foods • Drinks • Medicines • Biological specimens 	<ul style="list-style-type: none"> • AAS – Flame, Graphite Furnace • Fluorescence Spectrometer • Fourrier IR Spectrometer • GCMS • GCMSMS • Gas Liquid Chromatograph • Ion Chromatograph • UHPLC • UV Vis Spectrometer 	None
National Environmental Laboratory (NEL), MoESD	<ul style="list-style-type: none"> • Ambient air • Surface waters • Industrial effluents • Sea waters 	<ul style="list-style-type: none"> • AAS – Flame, Graphite Furnace • GCMS • HPLC • Flame Photometer • Mercury Analyser • TOC Analyser • Ion Chromatograph • UV Vis Spectrometer • Laser Spectrometer • Mobile ambient air-quality monitoring stations • Portable gas Analyser 	<ul style="list-style-type: none"> • Physico-Chemical parameters: pH, Temperature, Conductivity, Solids (Total, Total Suspended, Fixed & Volatile) • Inorganic parameters: NH₃, NO₃, NO₂, S₂O₄, P₃O₄, Cl • Metal parameters: Fe, Cu, Ni, Zn, Mn, Cd, Pb, Co, Na, K, Total Cr <p>NEL is also ISO 9001 Certified.</p>

Agricultural Chemistry Department, MCIA, MoAIFS	<ul style="list-style-type: none"> • Agricultural crops • Sugar • Surface waters • Wastewaters • Soils • Pesticide residues in some of the above media 	<ul style="list-style-type: none"> • AAS – Graphite Furnace • FIA system • GCMS • HPLC • Spectrophotometers • Microwave Digester Oven • Polarimeter/Refractometer • Elemental Analyser-IRM analyser • Bomb Calorimeter • COD Analyser • Flame Photometer 	<ul style="list-style-type: none"> • Medium: water and effluents: pH, Salinity, Conductivity • Medium: sugars/molasses/cane juice/syrups: pH, polarisation, moisture, colour, Reducing sugars, Conductivity ash, As, Cu, Cd, Fe, Pb, Hg and S₂O₃ • Tests for soils: pH, N (Total, Mineral and Extractible), K (Total and Extractible), P (Total and Extractible). • Plants tests: N (Total), K (Total), P (Total), S, Ca, Mg
Agricultural Chemistry Division, MoAIFS	<ul style="list-style-type: none"> • Agricultural crops • Sea foods • Soils • Animal feeds • Fertilisers • Irrigation water • Plant materials • Pesticide residues in fruits and vegetables 	<ul style="list-style-type: none"> • AAS – Flame, Graphite Furnace, Cold Vapour • Flame Photometer • GC • HPLC • Kjeldahl Digestion Unit • Microwave Digester • UV-Visible Spectrophotometer 	
Food Technology Laboratory, MoAIFS		<ul style="list-style-type: none"> • AAS – Flame, Graphite Furnace • GC with ECD, FTD & FID • GC MSMS • HPLC MSMS • Flame Photometer • Kjeltch Distillation Apparatus • Microwave Digester • Moisture analyser 	TVB–N tests in fish products and for other microbiological tests
Chemical Technology & other sections, MSB	<ul style="list-style-type: none"> • Water • Food • Fish products • Cements • Fertilisers • Steel bars • Soaps & detergents • Fireworks • Paints • Aggregates • Galvanised products 	<ul style="list-style-type: none"> • ICP – OES • Mercury Analyser • Carbon-Sulphur Analyser • Oxygen & Hydrogen Analyser 	<ul style="list-style-type: none"> • Tests for carbon steel bars: Cu, Ni, Mo, Cr, Mn, V, P, N. Total C and Total S. • Tests for potable water: Al, As, Ca, Cd, Cu, Fe, K, Ni, Mo, Mg, Mn, Na, V, Pb, Zn • Tests for fish and fish products: Hg, Cd, Pb • Tests for stainless steel: Total C, Cr, Cu, Ni, Mo, Mn, N, P, Total S, V
Central Water Authority Laboratory, CWA	<ul style="list-style-type: none"> • Borehole water • Surface waters 	<ul style="list-style-type: none"> • Flame Photometer • TOC Analyser • UV-Visible Spectrophotometer 	<ul style="list-style-type: none"> • Physico-chemical: Colour, Conductivity, pH, Turbidity • Chemical: Cl, COD, K, NO₃, NO₂, NH₃, P (Total/Reactive), S₂O₄
Wastewater Management Authority Laboratory, WMA	<ul style="list-style-type: none"> • Wastewater • Treated effluents • Sludge 	<ul style="list-style-type: none"> • AAS – Flame, Graphite Furnace • GC-MS • TKN Analyser • Flow Injection Analyser • Flame Photometer • BOD Analyser • UV-Visible Spectrophotometer 	<ul style="list-style-type: none"> • Physico-chemical: pH, Conductivity, TSS • Chemical: Cl, COD, NO₃, NO₂, NH₃, P₂O₄, S₂O₄, Sum (NO₃ & NO₂) • Trace metals: Cu, Co, Fe, Mn, Ni, Pb, Zn
Forensic Science Laboratory, PMO	<ul style="list-style-type: none"> • Biological specimens • Drugs of abuse • Poisons 	<ul style="list-style-type: none"> • GC • GC-MS • LC-MS 	<ul style="list-style-type: none"> • Alcohol level determination in body fluids • Cannabis analysis • Heroin analysis
Assay Office, MoICCP	<ul style="list-style-type: none"> • Gold, Silver & Platinum alloys • Jewels • Gemstones 	<ul style="list-style-type: none"> • Cupellation Furnace • X-Ray Spectrometer • Automatic Potentiometer (Diamond View) 	<ul style="list-style-type: none"> • Assaying of Gold alloys/ jewellery
Albion Fisheries Research Centre, MoF	<ul style="list-style-type: none"> • Fish • Sea water 	<ul style="list-style-type: none"> • AAS – Flame, Graphite Furnace • HPLC • Mercury Analyser 	None

Centre for Biomedical and Biomaterials Research (CBBR)	<ul style="list-style-type: none"> • Agricultural crops • Surface waters • Wastewaters • Soils 	<ul style="list-style-type: none"> • DSC & TGA • PSA • UV-Visible Spectrophotometer • SEC Spectrometer • Centrifuge • Autoclave • Electrophoresis system • Ultralow Freezer 	None
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Source : Various stakeholders

¹ As of January 2014, all above accreditation statuses are valid except for the ACD, MCIA which has been kept on hold for re-assessment.

It must be noted that the laboratories of the various Departments of the UoM have not been included in Table 9.2. They are used for academic and research purposes and are not directly involved in regulatory or enforcement works, although the UoM may also act as a service provider, as mentioned in Chapter 6.

Moreover, many private enterprises, as previously stated have their own testing and quality control laboratories and a few of these also function as service providers i.e. operate on a purely commercial basis to provide third-party assessments. Private laboratories are accordingly equipped in respect of chemical analyses. They are also eligible for accreditation with MAURITAS or any other international accreditation bodies.

9.2 OVERVIEW OF TECHNICAL TRAINING AND EDUCATION

9.2.1 University education

In Mauritius, there are few institutions offering training and educational programmes which are related to the sound management of chemicals. Public educational institutions like Universities must bear recognition from the Tertiary Education Commission (TEC), a para-statal body under the Ministry of Tertiary Education, Science Research & Technology, for any regular programmes that provide. On the other hand, for any private courses provider, both the institutions and the trainers must be duly registered by the Mauritius Qualifications Authority (MQA) before dispensing the courses for the public. This registration may not be required for any in-house training programme intended for their own employees.

The description given below is for training and educational programmes provided by public institutions in relation to chemicals in Mauritius.

9.2.2 The University of Mauritius

The University of Mauritius (UoM) is the main tertiary education provider in Mauritius. It proposes courses from undergraduate to Doctoral levels through its Faculties, Centres and Departments. [23] Depending on the changing requirements of the labour markets, the courses are adapted as and when required or they may not be run if demands for seats in these courses are less than expected. For example, the Bachelor Degree's course in Chemical and Sugar Engineering, which started to be in less demand since the mid-2000s, a trend synonymous with the gradual decline of the of sugar industry in Mauritius.

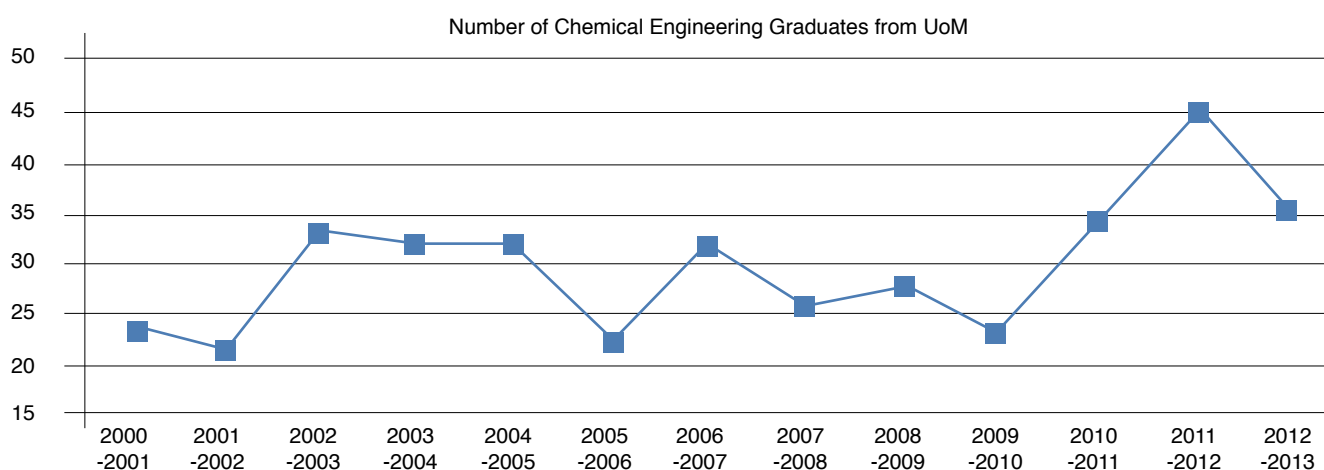
The courses which are related to the Sound Management of Chemicals (SMC) available at the UoM for the academic year 2013 – 2014 are shown in Table 9.3 below.

Faculty	Department	Course	Mode
Science	Chemistry	BSc (Hons) Chemistry	Full-time
		MSc Chemistry	Part-Time
	Health Sciences	Diploma / BSc (Hons) Occupational Safety & Health	Part-time
		Diploma in Sanitary Science	Part-time

Engineering	Chemical Engineering	BEng (Hons) Chemical and Environmental Engineering	Full-time
		BEng (Hons) Chemical and Renewable Energy Engineering	Full-time
		MSc Solid Waste Management Engineering	Part-time
		BEng (Hons) Sustainable Energy Engineering	Part-time
Agriculture	Agriculture	BSc (Hons) Sustainable Agro-chemical Management	Part-time

From year 2000 onwards, a total of 525 students both on full-time and part-time basis have obtained a qualification from the Faculty of Engineering after following relevant courses in fields related to chemicals management such as Chemical Engineering, Sustainable Environmental Engineering or Solid Waste Management. This total includes students of Certificate, Graduate and Post Graduate courses. Figure 9.1 shows the number of students graduating from the Department of Chemical Engineering.

Figure 9.1: Number of Chemical Engineering graduates from UoM 2000-2013



9.2.3 University of Technology Mauritius (UTM)

The University of Technology (UTM) is the second largest public provider of tertiary education in Mauritius as of January 2014. It was created in 2001 and provides courses through five Schools. Under the School of Sustainable Development and Tourism (SSDT), courses having modules relevant to chemical management are offered [24]. These courses are as follows:

- MSc Environmental Science : Part-time course
- Diploma / BSc (Hons) Occupational Safety & Health: Full-time course
- Diploma / BSc (Hons) Occupational Safety & Health: Part-time course
- Diploma in Environmental Health: Part-time course

9.3 CONCLUSIONS AND RECOMMENDATIONS

9.3.1 Recognising the importance of chemical-testing laboratories

Key ministries are equipped with testing laboratories to undertake analytical testing in different media. Not all laboratories have the same resources in terms of staff, equipment and other facilities. It is recommended that these ministries regularly upgrade resources of their laboratories.

The existing laboratories keep records of their stocks of chemicals and reagents. However, they also store obsolete chemicals and reagents within their premises. Moreover, they face disposal problems since the laboratories do not have treatment facilities for chemical wastes which they usually generate during and after testing work. It is recommended that the MoLGOI and WMA (MoEPU) provide specialised units for the collection of stored laboratory wastes to ensure that disposal is carried out in a sound manner. These services can be progressively extended to educational institutions and to private sector institutions which house chemical laboratories. A fee structure for the laboratory waste disposal can also be worked out eventually by these two regulatory institutions.

Some of the public sector laboratories have started to provide their analytical services to other parties against payment and therefore have become income-generating entities for their parental institutions. It is recommended that laboratory testing work be made payable, as far as practicable, owing to the high running costs of laboratories in terms of chemicals, reagents, CRMs, consumables, apparatus, equipment, etc. Moreover, part of the annual income generated for all sampling, testing and related activities should be redirected to the Governmental laboratories enabling them to upgrade their facilities periodically.

The concept of accreditation of chemical testing laboratories of both public and private sector to the ISO/IEC 17025:2005 Standard has been beneficial in upgrading the professional image as well as technical and human skills of these laboratories. It is recommended that relevant Governmental institutions, in their capacity of enforcing authorities, should provide the necessary facilities and resources to the laboratories falling under their purview, enabling them to implement, maintain and upgrade their accreditation status, as required, over a wide range of test parameters.

People working in Governmental laboratories are generally conversant with matters pertaining to the Sound Management of Chemicals. However, there is a strong need for further training on further technical issues such as on new techniques of analysis, laboratory data management systems or setting up their own waste disposal systems.

Despite having different existing laboratories in place, analytical testing of chemicals at importation stage remains a concern as there is no legal obligation that these should be tested prior to accepting them for sale, distribution and further uses. The need for testing a batch or sample of chemicals does arise in the case of doubtful information or suspicious consignments while the DCCB processes applications.

A few Ministries are not equipped with laboratories, for instance, the MoLIRE or the MoLGOI while they are also enforcing authorities as mentioned in respective legislations. As there is no adequate regulatory control of all chemical parameters on a routine basis, there is a lack of quantifiable data available such as:

- Levels of chemical contaminants generated at workplaces to ensure the health & safety of employees. This could be addressed through the creation of an industrial hygiene laboratory.
- Qualitative characteristics of hazardous wastes or of consignments containing chemical wastes. This could be addressed via a mini control laboratory within the Mare Chicose Sanitary landfill site or future facilities, prior to accepting waste for disposal.

9.3.2 Formulation of a National policy on scientific laboratories

As major investments would be required for setting up of new laboratories, it would be beneficial that governmental authorities introduce cost recovery mechanisms for the existing ones. Accordingly, part of the income generated from testing activities can be redirected to the laboratories enabling them to have more funds for the in day-to-day operation. A few means of generating income could be:

- Providing all analytical services only against payment with credit facilities if necessary.
- Introduction of green taxes on tests that require hazardous chemicals.

A national laboratory policy framework for capacity building is highly essential to improve the outputs and overall quality of services of the existing laboratories. It is recommended that this national policy considers the following activities:

- Minimise any tests being duplicated by more than one public laboratory
- Encourage more laboratories to be accredited to the ISO/IEC 17025 Standard for additional chemical parameters stipulated in different legislations.
- Set up a structure with the assistance of MAURITAS, MSB or other stakeholders so that chemical laboratories both from public and private sectors can participate in Proficiency Testing locally.
- Creation of a specialised scientific laboratory-servicing unit with the assistance of the Mauritius Institute of Training Development (MITD) and the Tertiary Education Commission (TEC) to cater for services such as repairs, maintenance and calibration of testing and non-testing equipment locally. It is known that during equipment breakdowns, assistance from service providers based outside Mauritius is often needed, while the whole repairs and maintenance exercise can be costly and time-consuming.
- Introduce chemical leasing facilities to afford major testing laboratory equipment or key equipment parts.
- As CRMs and calibration standards are very costly, a feasible means of sharing of such consumables by the local laboratories can be envisaged provided their quality is not affected.
- CRMs used by the testing laboratories should contain recently introduced active ingredients, as new molecules and compounds are regularly patented and used for the industrial manufacture of newer chemicals and chemical products. For instance, pesticides applied nowadays do not contain the same active ingredients as those used in the 1970's.
- Encourage information and experience sharing among different local laboratories conducting analytical work on similar parameters as well as regional laboratories.

9.3.3 Improving the status of scientific and technical education

For the Sound Management of Chemicals, educational and training institutions must be able to provide courses covering technical fields such as chemical sciences and engineering, toxicology, occupational health, industrial hygiene etc. The outcome of dispensing such courses is to have a highly skilled workforce in Mauritius.

The two main public universities in Mauritius offer courses for full-time and part-time students which have modules that are relevant in building a theoretical understanding of the Sound Management of Chemicals (SMC). As practical exposure opportunities for real SMC activities are limited for the students, the latter should obtain more industrial training as has been already recommended in Chapter 6. It is further recommended that relevant students from the UTM also benefit from such training as their counterparts from UoM.

Chapter 10

AWARENESS AND UNDERSTANDING OF WORKERS AND THE PUBLIC ON THE MANAGEMENT OF CHEMICALS

Knowledge sharing is a key aspect for the sound management of chemicals at various levels. It is as important for decision makers at the international level as for the nonprofessionals at local level. The responsibility to provide the required information rests on different stakeholders such as manufacturers or distributors of chemicals, Government and its departments, employers and workers' union, NGOs, etc. The role of the mass media in spreading information rapidly means that they also have a part to play in the process of providing information. Awareness raising conducted through training and educational purposes or provided by other ways, such as display of safety information posters creates a better understanding on chemicals, their properties and effects. This Chapter is about Awareness activities targeted towards workers and the public at large.

10.1 AWARENESS-RAISING ACTIVITIES ON CHEMICAL MANAGEMENT

Public awareness activities play an important role in the process of informing people about the threats which harmful chemicals may pose to their health and to the environment. As regards workers, employers have a legal duty as per the OSHA 2005 to inform the former about such hazards especially at the workplaces where chemicals are routinely used.

10.1.1 Activities undertaken by public sector stakeholders

(a) Ministry of Health & Quality of Life

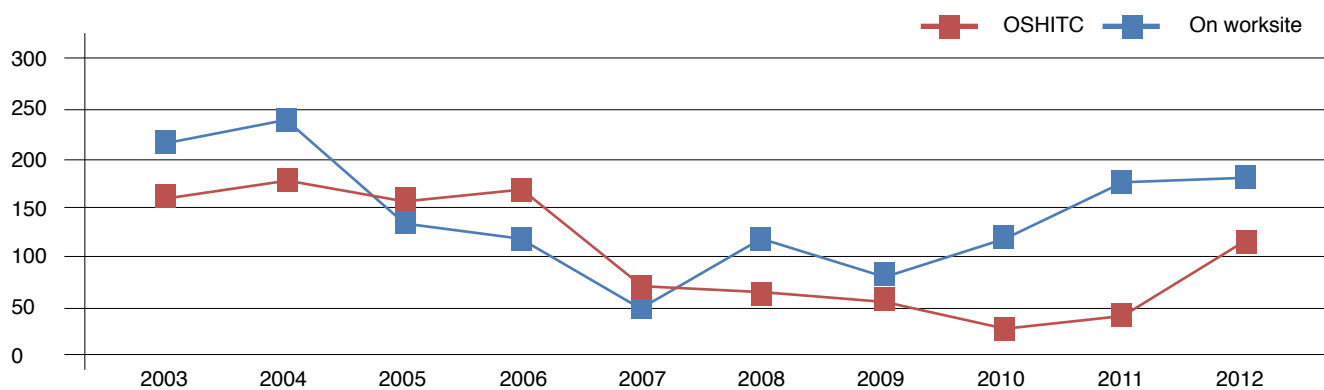
- As seen in Chapter 7, the DCCB has to conduct inspections and site visits for the issue of licences and permits to traders and users of chemicals, the MoHQL staff attached to the DCCB are required to interact with workers at the traders' and or users' facilities, to provide advice or recommendations. On an annual basis, about 240 inspections are conducted, which include premises visited for first time applicants for a trade licence.
- The Occupational Health Unit has been involved in the delivery of talks and presentations to workers on chemical safety and private sector employees have mostly benefitted.
- The CDCU also conducts ad hoc workshops e.g. for representatives of pest control companies.

(b) Ministry of Labour, Industrial Relations & Employment

The Occupational Safety & Health Inspectorate (OSHI) of the MoLIRE conducts awareness raising and training sessions for workers both at employers' facilities and at the Occupational Safety and Health Information Training Centre (OSHITC) located within the Ministry itself. At workplaces where chemicals are routinely used such as in the manufacturing industries, topics for such training programmes include chemical safety, safe handling of chemicals, correct use of PPE, etc. Moreover, at each workplace inspection conducted by the staff of the OSHI, workers are briefed on relevant topics.

According to its Annual Reports, the OSHI sensitised a total number of 53 713 workers through talks delivered on Occupational Safety & Health (OSH) both at the OSHITC and at workplaces for the period 2003 – 2012. Figure 10.1 shows the annual number of talks delivered by the OSHI and which included topics related to chemicals management. The variations noted in the number of talks is explained by a number of factors such as variations in the number of staff available to conduct such trainings, priority issues related to OSH and available funds.

Figure 10.1: Number of talks on OSH topics delivered by the OSHI from 2003-2012



Source: Annual Reports, OSHI

(c) Ministry of Environment and Sustainable Development

The MoESD has been very involved since its creation in raising public awareness on several themes such as pollution control, preservation of the environment, etc. The Ministry is called upon to conduct awareness sessions in educational institutions, regional community centres for disseminating information. On its website, it also provides much information on the various matters pertaining to the environment in Mauritius as well as the international commitments which the country has. The MOESD also assists in dealing with any public complaints concerning environmental pollution and its website provides a list of enforcing authorities along with their contact details which can be contacted. The MOESD has also been involved in creating awareness on POPs.

(d) Ministry of Agro Industry and Food Security

(i) Agricultural Research Extension Unit (AREU)

Since its creation, the Agricultural Research Extension Unit (AREU) has been very active in the sensitisation and training of planters and of the public in general. These activities mainly focus on advocating good agricultural practices and therefore include the sound agrochemical management. The AREU uses different ways to conduct these activities which are aimed at a greater awareness on health and environmental hazards posed by the use of chemicals in the agricultural sector. The AREU carries out its awareness raising measures through advisory training sessions, extension activities, radio and TV broadcasts, publications and through the internet.

- Advisory training sessions

These are mostly destined for farmers and are held either in AREU offices or on-site. The training courses are approved by the Mauritius Qualifications Authority (MQA) which is the national regulatory body for the recognition and evaluation of qualifications. The training modules on pesticides utilisation are as follows:

- Pesticide classification and understanding labels
- Pest identification/pesticide selection

- Pesticide and the environment
- Integrated pest management
- Safe handling and storage of pesticides
- Spraying technique, collaboration, use and maintenance of sprayers
- Good agricultural practices

Table 10.1 below provides more information on the types of training conducted by the AREU:

Table 10.1: Training conducted by AREU			
Training areas	Number of trainees	Training audience	Period
Training of trainers safe use of pesticides	30	Extension Officers	1999
Safe and judicious use of pesticides	4 800	Farmers	1999 – 2013
Pesticide application	220	Sprayermen/workers	2011 – 2012
Good agricultural practices	107	Farmers	2010 – 2013
Use of bio-pesticides	150	Farmers and Extension Officers	2007 – 2008
Sustainable farming	400	Farmers and Extension Officers	2013

Source: AREU Main Office

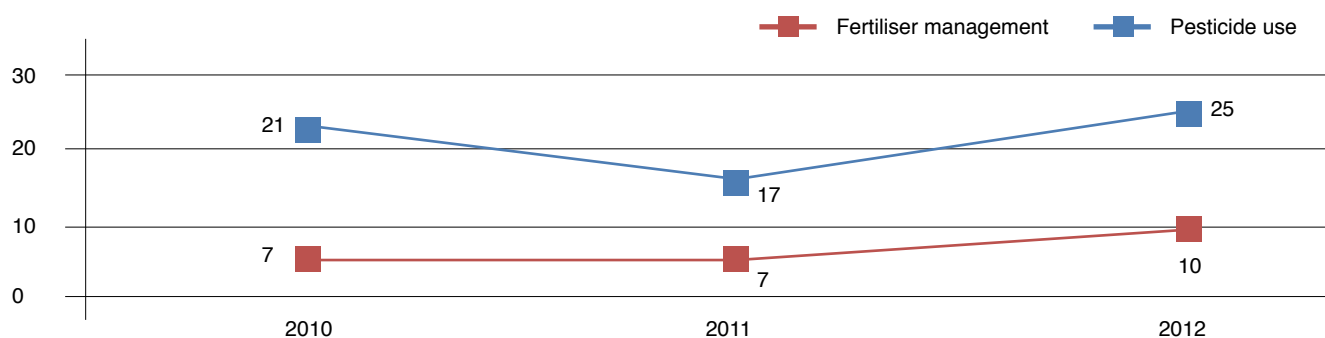
- Extension activities

Such activities are conducted through group meetings, demonstrations and conducted tours on farms or on its research stations for famers.

- Radio & TV broadcasts

Weekly programmes are broadcasted on a public radio channel in two local languages namely Creole and Bhojpuri where officers of the AREU provide explanations about a particular topic. The talk shows are also broadcast on national TV as well. Figure 10.2 shows the number of radio talks for the period 2010 – 2012.

Figure 10.2: Number of radio talks by AREU on topics related to agrochemicals



- Publications

Periodic newsletters entitled ‘Farming News’ and special publications are also produced and contain useful information and articles on the use of agrochemicals. The special publications are put on sale and can be easily procured at AREU offices or any other designated venues. The following is a list of their publications relevant to agrochemicals management:

- > Mieux gerer l’utilisation des pesticides en milieu sensible (2002)
- > L’utilisation raisonnée des pesticides (2nd ed. 2007)

- > Conseils pratiques sur l'utilisation des pesticides (2003)
 - > Guide d'utilisation des produits phytosanitaires (PHI of Common pesticides/2012)
 - > Biological control of pests
 - > Comment éviter les accidents dus aux pesticides
 - > Guide agricole
 - > Fungicide handbook
 - > Compatibility chart for agro-chemicals
 - > Traitement des semences
 - > Safe and judicious use of pesticides (video/CD publication)
- Internet

In addition to the above, the AREU provides information on its website and hosts a blog where it provides information on various topics, inclusive of agrochemical management, in such a way that people can engage in on-line discussions by sharing of ideas, opinions and knowledge. [18]

(e) Ministry of Local Government and Outer Islands

The Ministry of Local Government and Outer Islands launched an awareness campaign in 2013 to encourage the recycling of used mobile phones and batteries with the collaboration of Mauritius Telecom (MT) as partner. Information on the hazardous nature of these wastes was given to the public via posters, the print press as well as publicity through the national television to capture public attention.

In this context, within the various outlets of MT across the country and at other public offices, cash counters like post offices, specially designed collection boxes were installed for the proper disposal of these items by the public.

(f) Mauritius Fire and Rescue Services

The Mauritius Fire and Rescue Services (MFRS) under the MoLGOI are involved in delivering training and awareness programmes on fire safety. These can be for different categories of workers in various sectors i.e. at their own workplaces but can also be for the public at large.

Being an enforcing agency for any stakeholders using, storing or transporting flammable substances like solvents or petroleum products, they are called upon to conduct such training and awareness activities. These also include practical sessions to operate fire extinguishers safely and fire drill exercises. Moreover, the MFRS is called upon to respond to different types of accidents or events, and not only fires, whereby rescue must be provided to people. In this respect, they also provide some basic awareness on how to respond and react in such scenarios as described in their various pamphlets.

(g) Ministry of Industry, Commerce and Consumer Protection

(i) Assay Office

As mentioned in Chapter 5, the Assay Office of the MoICCP is involved in raising awareness within the jewellery sector for which it is a regulatory authority. It has also released publications containing information for the jewellers such as on the safe utilisation of Mercury for jewellery polishing namely "*L'utilisation du Mercure dans le secteur de la bijouterie*". [25]

(ii) Consumer Protection Unit

The Consumer Protection Unit was previously involved in the elaboration and the editing of the consumer awareness magazine "*Savoir Choisir*".

10.1.2 Activities undertaken by Academia & Research Groups

(a) University of Mauritius

The University of Mauritius has also been involved in activities aimed at the promotion of chemical sciences and related issues. The Chemical Society of Mauritius (CSM) created for this very purpose in 2001, under the Department of Chemistry of the UoM, provided a platform for individuals having interest in the popularisation of Chemistry and to build new avenues of collaboration between various local institutions. As a member of the International Union of Pure and Applied Chemistry (IUPAC), the CSM organised a few activities for e.g. contests for Chemistry students. It was also involved during the organisation of the 'Polymers for Africa' International Conference hosted by the UoM in 2005.

10.1.3 Activities undertaken by NGOs

(a) PANeM

As mentioned in Chapter 6, the NGO, PANeM has been involved in raising awareness about pesticides and harmful chemicals such as Mercury within Mauritius. Secondary school children have also benefitted from their talks organised at different schools which also enabled them to distribute free booklets to these students to make them more conscious about hazardous chemical substances. The booklets have been published in English Language are easy to understand and include coloured pictures to capture the attention of students and are entitled 'Mercury-Free Schools' and 'Mercury-Free Schools High School Module'.

Moreover, for an awareness raising activity in two fishing villages in the south-eastern part of Mauritius in June 2013, it received assistance of the respective Village Councils to provide the local inhabitants present with explanations on Mercury and its toxic effects. On those occasions, the representatives of PANeM had the opportunity to proceed with hair sampling of women of children-bearing age [20].

10.1.4 Activities undertaken by workers associations

(a) Chemical Manufacturing and Connected Trade Employees Union

The CMCTEU conducts awareness sessions for their members on different themes, some of which are related to chemical safety at work.

10.1.5 Activities undertaken by the mass media

(a) Television broadcasting

The Mauritius Broadcasting Corporation is the only public television broadcasting institution in Mauritius. As it is called upon to dispense news at the national, regional and international levels, this includes information about chemical accidents, spills, intoxication cases and other related items of mismanagement of chemicals.

It also proposes programmes to improve chemical management in Mauritius, such as good practices for planters using pesticides and fertilisers in their fields. These programmes are available in local languages, i.e. Creole and Bhojpuri so as to enable the audience to have a better understanding. For many of these programmes, the Open University of Mauritius, a distance education provider, and other public institutions like the AREU and the ex-MSIRI provide useful collaboration.

(b) Newspapers/Magazines

Local newspapers, magazines and other publications give coverage to events and situations related to chemicals at different stages of their life cycle, and provide information about these to the general public.

10.2 CONCLUSIONS AND RECOMMENDATIONS

10.2.1 More emphasis on awareness & training

Awareness is of very high importance to make people conscious about the risks that some chemicals may pose to health and environment. Through their mandates or further to specially arranged activities, various stakeholders are involved in creating awareness on health and environmental risks due to chemicals. It is recommended that awareness and training activities are kept recurrent for the benefit of the public. In addition, the activities should be broadened to cover other chemicals, i.e. other than agrochemicals.

It is notable that the Republic of Mauritius has already various training institutions, both governmental and private ones, and a proper framework, through the Mauritius Qualifications Authority (MQA) to embark on various types of training. It is further recommended that there be agreements and Memoranda of Understanding (MoUs) between such institutions and employers to introduce relevant training courses for employees. For example, the Mauritius Institute of Training and Development (MITD) can be approached to arrange for specialised training of drivers of vehicles carrying flammable substances and other chemical goods on the roads. These types of training courses may also necessitate more than one training providers and can be done through collaborative approaches. It is further suggested that appropriate international training institutions having expertise in specialised fields be contacted for sharing of knowledge and demonstration of best practices.

In spite of all efforts put in for creating awareness and providing training in respect of the risks arising from the use of chemicals, it can be difficult to measure the success of conducted programmes. It is recommended that there be post-training assessments to know the extent to which people actually implement good practices related to chemicals further to such programmes. Such assessments can be done through inspections, checks, audits, etc. to ensure good practices are adopted.

People from various communities such as workers groups, women's associations, elder citizens' associations, planters, etc. may require information about chemicals, for e.g. health and safety aspects, sound practices, trade conditions, disposal requirements, etc. Accordingly, an adequate forum must be available to provide the requested information in view of knowledge sharing. It is recommended that representatives of relevant Governmental institutions be called upon to conduct brief presentations or provide short talks for small groups of people within existing Governmental facilities such as Community centres and Citizens Advice Bureaus.

Short-term courses of a duration of a few days to few weeks period can be introduced to increase awareness about chemicals and specifically aimed for people having to sell, transport, handle, store or dispose of chemicals. Such courses can be provided locally by professional trainers and sanctioned by a valid certificate qualifying the trainees to undertake job-related activities related to different stages of the life cycle of chemicals. Various micro-enterprises or SMEs which may not be able to provide in-depth training to their employees would obviously benefit from such courses if introduced. It is recommended that relevant authorities conduct such short term training activities at national level for the small and micro-enterprises industries against a small fee.

10.2.2 Developing new approaches to public awareness

To enhance public awareness on chemicals and related aspects to them such as risks to human health, accidents, fires, etc. simple measures can be adopted with an aim of creating better understanding on chemicals such as:

- Displaying of the inscription 'Chemical goods vehicle' on vehicles used for transporting chemicals and chemical goods on public roads.
- Encouraging people at various levels to adopt waste segregation techniques thereby preventing chemical wastes from being mixed with domestic or municipal wastes.
- Introducing special signboards to notify and warn the public about high risks zones i.e. where major facilities are situated for e.g. bulk fuel depots or chemical warehouses, etc.
- Encouraging proper labelling of consumer products and other goods containing harmful active ingredients, whereby consumers can easily recognise the hazardous nature of these products.
- Introducing a system for planters to notify the required time intervals before any harvesting is conducted i.e. after applying pesticides or other agricultural chemicals.

Chapter 11

RESOURCES FOR THE MANAGEMENT OF CHEMICALS

In general, the Sound Management of Chemicals can be achieved at different levels but it greatly depends on the availability of adequate resources, in particular the human resources. At national level, it is essential to have a pool of trained professionals for this purpose. In order to perform their duties, they must avail of other resources such as appropriate infrastructure, logistics and support personnel. Accordingly, different types of professionals are needed for an effective SMC for instance chemists, toxicologists, chemical engineers, safety inspectors, occupational doctors, etc. while being assisted by non-scientific professionals such as customs officers, data controllers, policy and legal experts. This Chapter provides more information on the human and associated resources available in Mauritius for the Sound Management of Chemicals.

11.1 OVERVIEW OF RESOURCES AVAILABLE IN GOVERNMENTAL INSTITUTIONS

As described in Chapter 5, the Central Government is composed of different Ministries, whereby some of them are called upon to manage chemicals, chemical products or chemical wastes as per their mandates. Accordingly, the non-human resources like logistics, financial resources also differ for each institution. As of January 2014, the human resources available in many Governmental institutions to manage chemicals are considered inadequate. For instance, the DCCB is manned by two Occupational Health Physicians and two Public Health & Food Safety Inspectors of the MoHQL for the day-to-day management of chemicals in Mauritius. Accordingly, not all SMC responsibilities can be fulfilled in such situation. Table 11.1 provides a brief description of the human resources as of January 2014 available at key Governmental institutions for managing chemicals.

Table 11.1: Human Resources in key Governmental Institutions for the SMC

Ministry/Agency	Number of staff		Type of expertise available
	¹ Professional	² Support	
OHU/DCCB Secretariat MoHQL	8	3	<ul style="list-style-type: none"> • Registration of chemicals • Issue of licences & permits for chemicals • Processing applications • Verifications of technical documents like SDS. • Site visits & Inspections • Advice on chemical matters
GAD, MoHQL	25	10	<ul style="list-style-type: none"> • Laboratory testing of various samples (food, beverages, pharmaceuticals) • Pre-Market Approval Permits • Advice on food and pharmaceutical drugs quality

EHEU, MoHQL	19	1	<ul style="list-style-type: none"> • Public health & environmental matters concerning odour and drinking water • Site visits & Inspections • Enforcement • EIA Licences & PER • Advice on pollution cases
CDCU, MoHQL	5	142	<ul style="list-style-type: none"> • Public Health Control (larviciding, fumigation, etc.) • Health screening of passengers at port and airport • Recommendation for use of insecticides in planes /ships
VBCD, MoHQL	7	32	<ul style="list-style-type: none"> • Vector Control operations & evaluations • Evaluation of pesticides efficacy • Advice and awareness-raising on vector controls
OSHI, MoLIRE	40	-	<ul style="list-style-type: none"> • Workplace inspection • Registration of factories, SHOs, boiler inspectors, etc. • Enforcement • Training • Accident investigation, • Advice on chemicals used at workplaces
MoESD	19	4	<ul style="list-style-type: none"> • Inspections & Site visits • Enforcement • EIA Licences & PER • Contingency planning for oil spills • Climate change and coastal management • Advice on pollution cases and environmental matters • Investigations & prosecutions in case of offences • Project implementation
NEL, MoESD	13	7	<ul style="list-style-type: none"> • Sampling & Laboratory testing of air, waters • Advice on environmental matters
MSB, MoICCP	41	30	<ul style="list-style-type: none"> • Developing Standards • Laboratory testing of various products • Product Certification • Advice on quality matters
ACD + FTL/MoAIFS	20	40	<ul style="list-style-type: none"> • Laboratory testing on agricultural crops, soils, water, etc. • Advice on agricultural matters to planters, farmers and other operators in agri-business
ACD/MCIA MoAIFS	8	5	<ul style="list-style-type: none"> • Laboratory testing on agricultural crops • Advice on agricultural matters • R&D on sugar cane varieties • Experimentations on agrochemicals
AREU, MoAIFS	14	30	<ul style="list-style-type: none"> • Sampling & Laboratory testing • R&D on plant crops • Experimentations on agrochemicals • Training of planters • Public awareness for proper uses of agrochemicals.

Entomology Div., MoAIFS	14	151	<ul style="list-style-type: none"> • R&D on the management of agricultural pests • Studies on insect biodiversity and conservation • Containment/eradication of exotic insects • Surveillance of insect pests
MoLGOI	16	2	<ul style="list-style-type: none"> • Management of wastes disposal facilities • Advice and recommendation on modes of wastes disposals
EHU, SMF/MPF	³ dna	³ dna	<ul style="list-style-type: none"> • Handling & Uses of explosive substances • Attending explosion alerts
MFRS, MoLGOI	20 (per team)	-	<ul style="list-style-type: none"> • Safety inspection • Fire-fighting • Emergency & Rescue services • Training and awareness
CWA Lab, CWA	19	1	<ul style="list-style-type: none"> • Sampling & Laboratory testing • Advice on drinking water quality
WMA Lab, WMA	10	2	<ul style="list-style-type: none"> • Sampling & Laboratory testing • Advice on water quality and water pollution control
FSL, PMO	33	7	<ul style="list-style-type: none"> • Forensic investigation • Laboratory testing • Legal matters
AFRC, MoF	22	6	<ul style="list-style-type: none"> • Sampling & Laboratory testing of sea-foods • Advice on sea water quality
CD, MoFED	40	-	<ul style="list-style-type: none"> • Clearance of chemical imports and exports • Classifications of chemicals
CTU, MPF	dna	dna	<ul style="list-style-type: none"> • Site visits & inspections • Advice on chemical matters (incidents, vulnerability of storage sites, hazard evaluation, etc.)

¹ Professional : Doctors, Engineers, Scientists, Officers, Inspectors, Lab. Technicians, etc.

² Support : Non-technical staff or manual-grade workers e.g. Lab. / General Attendants, Drivers, etc.

³ dna : data not available

As regards the financial resources made available to each institution, the amount of funding for these institutions depends on the annual budget allocations from the Central Government and is announced during the Budget speech. It must be pointed out that these allocations are influenced by the Governmental policies put in place to cater for issues based on the order of priority.

In Chapter 9, it was noted that specific academic courses offered at tertiary education level in Mauritius, contain modules relevant for the Sound Management of Chemicals. As for the training of Governmental stakeholders, various training programmes, workshops and seminars related to chemical management have also been conducted at national level. The target audience for such programmes has been working professionals from relevant fields and nominated by their respective institutions. Table 11.2 summarises some of the main training courses including workshops and seminars held at national level since 2005 in Mauritius.

Table 11.2.: Summary of national training, workshops and seminars related to the SMC				
Year	Area	Description	Lead organiser(s)	Aim(s)
2005	Health & Environment	National workshop on the Stockholm Convention on POPs	MoESD	Endorsement POPs NIP workshop
2006	Laboratory Management	National Workshop on Scientific Laboratory Management	TEC, Uo /NUSESA	Greater awareness for the management of scientific laboratories
2008	Sea transportation	National Seminar on Ballast water management for public and private sector stakeholders	MPI	Awareness and understanding of International Convention for Control and Management of Ships Ballast water and Sediments
2009	Health & Environment	Sustainable management on POPs in Mauritius	MoESD, MoHQL and UNDP	Sound elimination of POPs and discussion about alternatives to DDT in Mauritius
2009	Laboratory Management	Workshop on Preventive maintenance of scientific Laboratory equipment	CIS/TEC	Awareness for preventive maintenance of laboratory equipment.
2009	Waste Management	Training Course on Industrial Waste Audit (IWA) for working professionals further to the IWA Regulations 2008 promulgated under the EPA	MoESD and UoM	Greater understanding of stakeholders' roles and responsibilities for the requirements of the IWA Regulations.
2012	Hazardous wastes management	Technical workshop on hazardous wastes management	MoLGOI	Validation of the findings of the Inventory study on hazardous wastes in Mauritius
2012	Transportation of hazardous wastes & chemicals	Regional training workshop on environmentally safe trans-boundary movements of hazardous wastes and chemicals	MoLGOI, Africa Institute and KEMI	Capacity building for participants from English Speaking African countries and knowledge exchange and ideas on hazardous wastes issues.
2013	Sound Management of Chemicals	Inception workshop for Mauritius SAICM Initiative	MoHQL and UNDP	Official launching of the Mauritius SAICM Initiative and discussions about chemical management in Mauritius
2013	Sound Management of Chemicals	Priority Setting Workshop for Mauritius SAICM Initiative	MoHQL and UNDP	Stakeholders' Consultation for setting of Priority Actions for the Sound Management of Chemicals in Mauritius
2013	Disasters (Natural & man-made)	Regional workshop for better preparedness towards disasters	UNEP/OCHA, PMO and MoESD	Creating better awareness towards any kinds of disasters and to introduce an Industrial Hazard Mapping exercise using GIS.
2013	Sound Management of Chemicals	Plan of Action Workshop for Mauritius SAICM Initiative	MoHQL and UNDP	Adoption of a National Action Plan for the Sound Management of Chemicals in Mauritius
2013	Mercury Management	Working session on the Mercury Action Plan in Mauritius	MoESD/MoHQL and UNDP	Presentation of National Inventory for Mercury releases (Level 1) and elaboration of an Initial Mercury Action Plan for Mauritius
2014	Sound Management of Chemicals	National Chemical Profile for the Republic of Mauritius	MoHQL and UNDP	Working session for final draft of National Chemical Profile of the Republic of Mauritius
2014	Sound Management of Chemicals	Validation workshop for Mauritius SAICM Initiative	MoHQL and UNDP	

11.2 RESOURCES NEEDED BY GOVERNMENTAL INSTITUTIONS

All Governmental institutions do not have similar responsibilities for the Sound Management of Chemicals due to differences in their mandates. This explains why the Table 11.1 showed variations in the number of staff and the available scientific expertise within these institutions. In general, the professional staff joining these institutions may not always be skilled and knowledgeable on SMC issues. Accordingly, supervising officers of the Governmental institutions are called upon to offer guidance and awareness to their staff right from induction phase.

Within the scope of the Government of Mauritius/UNDP/UNEP SAICM Initiative, a National Action Plan (NAP) for the Sound Management of Chemicals has been devised. The NAP has been consolidated further to consultations with stakeholders. As per the NAP, nine high level priorities on SMC have been identified among which are actions which are related to capacity building for SMC and resources to be made available to key Governmental Institutions. Table 11.3 shows the training requirements of Government institutions to fulfill their SMC responsibilities.

Table 11.3: Training needed by Government Institutions to fulfil SMC responsibilities	
Ministry/Institution	Identified training areas (scientific/technical fields)
OHU/DCCB Secretariat, MoHQL	<ul style="list-style-type: none"> Better understanding of GHS Statistical analysis of quantitative data
GAD, MoHQL	<ul style="list-style-type: none"> New techniques for analysis of chemical contaminants in foodstuffs, drinks, and medical drugs Laboratory waste management
CDCU, MoHQL	<ul style="list-style-type: none"> New techniques using sound alternatives for pesticide applications
OSHI, MoLIRE	<ul style="list-style-type: none"> Better understanding of GHS New techniques for analysis of dusts, aerosols and other chemical contaminants in working environments Statistical analysis of quantitative data
MoESD	<ul style="list-style-type: none"> Better understanding of GHS Statistical analysis of quantitative data Safety & precautionary measures for the handling, uses, storage, and disposals of chemicals Impact assessment studies for the uses of chemicals Contingency planning as per Environmental Monitoring Plan
NEL, MoESD	<ul style="list-style-type: none"> New techniques for analysis of chemical pollutants in various media Laboratory waste management
MSB, MoICCP	<ul style="list-style-type: none"> Better understanding of GHS Laboratory waste management
ACD & FTL, MoAIFS	<ul style="list-style-type: none"> New techniques for analysis of chemical contaminants in fruits, vegetables, waters, soils, etc. Laboratory waste management
ACD/MCIA, MoAIFS	<ul style="list-style-type: none"> New techniques for analysis of chemical contaminants in fruits, vegetables, waters, soils, etc. Laboratory waste management
AREU, MoAIFS	<ul style="list-style-type: none"> New approaches using sound alternatives for pesticide applications Integrated pest and plant disease management Knowledge on new molecules (active ingredients) used in pesticides
Entomology Div, MoAIFS	<ul style="list-style-type: none"> New approaches using sound alternatives for pesticide applications
MoLGOI	<ul style="list-style-type: none"> Pre-treatment and treatment methods for specific types of hazardous wastes
SMF, MPF	<ul style="list-style-type: none"> Basic Chemistry knowledge for classification purposes
MPF	<ul style="list-style-type: none"> Training of trainers for drivers of chemical goods vehicles Basic Chemistry knowledge for classification purposes
MFRS, MoLGOI	<ul style="list-style-type: none"> Basic Chemistry knowledge for classification purposes
CWA inc. CWA Lab.	<ul style="list-style-type: none"> New technologies for drinking water treatment Laboratory waste management (lab. only)
WMA inc. WMA Lab.	<ul style="list-style-type: none"> New technologies for wastewater treatment Laboratory waste management (lab. only)

FSL, PMO	<ul style="list-style-type: none"> • New techniques for analysis of illicit drugs (synthetic or natural) • Laboratory waste management
AFRC, MoF	<ul style="list-style-type: none"> • Laboratory waste management • New techniques for analysis of chemical contaminants in fish and other sea food products.
CPU, MoICCP	<ul style="list-style-type: none"> • Basic Chemistry knowledge for classification purposes • Better understanding of GHS
CD, MoFED	<ul style="list-style-type: none"> • Basic Chemistry knowledge for classification purposes
SM, MoFED	<ul style="list-style-type: none"> • Basic Chemistry knowledge for classification purposes

If resources made available to the Governmental Institutions are inadequate, the implementation of activities pertaining to the Sound Management of Chemicals would be hampered. In Table 11.4, a brief analysis of the consequences of inaction in respect of the SMC is depicted in a qualitative manner over four main areas.

Table 11.4: Consequences of Inaction in respect of SMC implementation	
Cause – effect relationships for inaction to the SMC	
Area I: Occupational health	
Causes of inactions	Measurable indicators
<ul style="list-style-type: none"> • Employees not wearing Personal Protective Equipment gloves, masks, boots, etc. • Employers not providing regular medical examination, follow-up, medication, etc. to employees • Lack of awareness, sensitization and training for workers • Lack of enforcement by regulators 	<ul style="list-style-type: none"> • Number of man-days lost • Workplace accident ratios • Cost of medical treatment • Absence from work • Reduced productivity • Foregone income for the family
Area II: In society	
Causes of inactions	Measurable indicators
<ul style="list-style-type: none"> • Lack of public awareness on sound uses of consumer chemicals • Lack of sensitization to prevent misuses, such as suicides • Consumer chemicals not providing proper safety and warning information on product labels. 	<ul style="list-style-type: none"> • Cost of medical treatment • Number of suicide attempts • Number of assaults due to chemicals • Costs of rehabilitation of drug addicts
Area III: Transport & distribution	
Causes of inactions	Measurable indicators
<ul style="list-style-type: none"> • Lack of training for drivers of vehicles transporting chemicals • Lack of proper vehicle maintenance • No. display of warning information on vehicles transporting chemicals 	<ul style="list-style-type: none"> • Number of road accidents involving vehicles transporting chemicals • Vehicle maintenance costs • Vehicle assurance costs
Area IV : Food/Environmental contamination	
Causes of inactions	Measurable indicators
<ul style="list-style-type: none"> • Lack of adequate laboratory testing of quality of foods (vegetables, fruits, meat, fish, milk, etc.) for chemical contaminants • Planters and farmers not respecting PHIs of locally produced food crops. • Lack of pollution control and waste treatment leading to contamination of food by toxic chemicals such as heavy metals. 	<ul style="list-style-type: none"> • Amounts of pesticides applied / land area • Cost of laboratory testing • Cost of medical treatment due to food poisoning • Levels of pollutants or contaminants as specified in legislations for e.g. MRLs or PELs. • Cost of rehabilitations of affected environment • Size or area affected e.g. land area • Amount of affected or adulterated foods

11.3 CONCLUSIONS AND RECOMMENDATIONS

11.3.1 Provision of adequate resources

In their respective capacities of enforcing agencies or regulatory authorities, the Governmental institutions need to be adequately structured, equipped and staffed. It is recommended that human resource requirements be reviewed and more resources be allocated, where applicable, in this context.

It may be noted that, as of January 2014, the MoLIRE is not capable of conducting quantitative or qualitative analysis of dust particles and other chemical contaminants inside workplaces. It is recommended that adequate budget enabling the procurement of monitoring and testing equipment and other applicable resources be provided as and when required.

It is also suggested that funds be tapped from International donor agencies involved in assisting developing countries in SMC areas, and that International UN agencies providing training be contacted to avail of training programmes for representatives of Governmental institutions in specified areas.

Depending on future Governmental decisions, the setting up of a new Governmental institution dedicated to manage chemicals exclusively may be envisaged. This major undertaking will require adequate resources in terms of staff, logistics and infrastructure and an in-depth feasibility study is required. However, there would have to be a consensus while deciding whether the specialised institution must be attached to a specific Ministry.

11.3.2 Greater emphasis on training at national level

As observed in the Table 11.2, in many cases training requirements are similar for several Governmental institutions. On the other hand, some institutions may require specific training since their routine activities are highly specific, for instance training in marine chemistry may be needed by the Albion Fisheries Research Centre (AFRC) only. It is recommended that an in-depth Training Needs Analysis (TNA) be conducted at a regular frequency e.g. every three or five years to identify the specific topics for which training is required.

All records of training must be properly kept within each institution, as the trained staff may, in turn, need to train other people in specific areas in the future. It is recommended that a proper training database be set up for this purpose.

Chapter 12

OVERALL CONCLUSIONS & RECOMMENDATION

With new sectors contributing to the Mauritian economy as evidenced by an increasing industrial growth and number of service providers, the needs for chemicals in these sectors have also increased. Accordingly, endeavours towards the Sound Management of Chemicals in the Republic of Mauritius are greatly justified. Moreover, alignment with best international practices, policies and mechanisms to manage chemicals will prove highly beneficial for the country to manage chemicals. It can be concluded that a holistic approach and multi-stakeholder commitment would pave the way to the SAICM 2020 Goal.

12.1 OVERALL CONCLUSIONS

Considering the gradual shift from agriculture to services & industries as the leading economic sectors, the requirements for chemicals and chemical products in these sectors are expected to follow the same trends. It has also been observed that various laws related to chemicals have been enacted under the purview of the Ministerial institutions, including para-statal bodies of the Government of Mauritius. On the other hand, other stakeholders such as the public Universities, Industry groups, NGOs and consumer groups, etc. have a specific role to play in the entire mechanism of managing chemicals in a sound manner at national level. The Sound Management of Chemicals requires an integrated approach and commitment from various stakeholders in the Republic of Mauritius to achieve the SAICM 2020 Goal. Without a proper structure in place for partnerships and collaborations, the expectations may not be fulfilled. It is recommended that a pro-active approach be adopted by stakeholders as the impacts on health and environment due to chemicals of future generations will depend on the present status of chemical management.

12.2 FINAL RECOMMENDATIONS

The Government of Mauritius/UNDP/UNEP SAICM Initiative is a good basis to the analysis of chemicals management in the Republic of Mauritius and identifying the appropriate steps for SMC. Table 12.1 below summarises the key recommendations that have been made throughout the SAICM project and which will need to be implemented in order to achieve the SAICM 2020 goal.

Chapter	Key Recommendations
Chapter 2: Chemical Production, Trade, Transport, Use and Disposal	<ul style="list-style-type: none">• Necessary resources must be provided to introduce basic testing of chemicals (e.g. at importation stage) in order to avoid any cases where documents provided at import are not in accordance with the actual chemicals.• The framework for collection of statistics on chemicals should be strengthened throughout the life cycle of the chemicals.• More awareness is required on the hazardous nature of chemicals throughout its life cycle.• Private sector operators should be involved in hazard mapping exercises in Mauritius.• Strict guidelines must be set for the demarcations of such areas where dangerous chemicals are to be stored, used and disposed of.• Vehicle used for the transportation of chemicals must be properly labeled and equipped.• A special renewable licence for the proposed 'chemical goods vehicles' can be created to ensure that the labelling and corresponding safety equipment adhered to. Appropriate training should also be dispensed to drivers.• Better enforcement is also required at selling points to make sure that the products commercialised correspond to the labels used.• There is an acute need to have proper disposal systems (with a properly formulated cost recovery mechanism) and facilities in place for chemical and hazardous wastes.• The 'Polluter Pays Principle' must be adopted by enforcing authorities in order to discourage unsound disposals of chemicals.

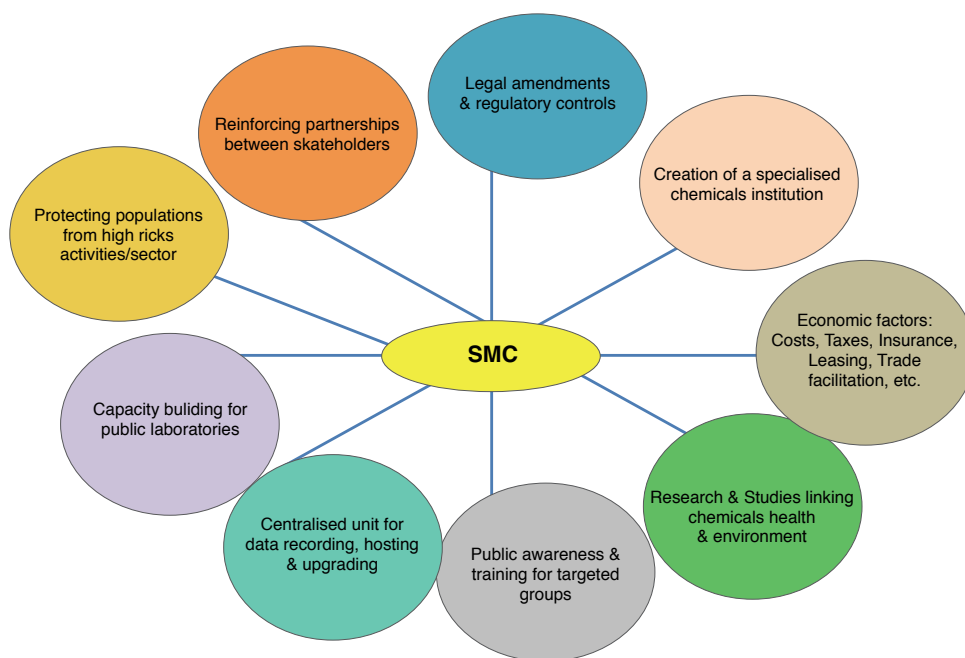
<p>Chapter 3 : Impacts and Challenges for the Management of Chemicals</p>	<ul style="list-style-type: none"> • A consolidated database for chemicals management should also contain up to date information accidents, pollution cases, poisoning/ suicide cases related to the use of chemicals. The database should also contain the financial and economic indications on the consequences of improper use of chemicals e.g. amounts paid by insurance companies, days of work lost, etc. • More frequent monitoring of chemical pollutants must be undertaken on waters, soils, or ambient air in the vicinity where hazardous chemicals are used or stored. • It is also recommended that proper monitoring programmes for wastewaters, treated effluents, contaminated soils or gaseous emissions be set up for specific point sources. • The use of greener chemical alternatives should be encouraged through awareness or by using other forms of incentives. • It is strongly recommended that more resources be devoted to conduct health studies on groups at risk. These studies would be helpful to establish links between health, environment and chemicals • It is also recommended that levels of pesticide residues be more frequently determined and made public by the government laboratories and appropriate action taken in case of higher than expected levels. • There should be a better synergy amongst the governmental institution enforcing the Occupational Safety & Health Act (OSHA) • It is also important that all Occupational Health Physicians whether operating in the public system, and in private practice report all cases of workplace chemical related accidents on a unified platform. • More elaborate and specialised capacity building programmes should be implemented for stakeholders in the field of occupational safety & health • Training on the Globally Harmonised System (GHS) for labelling should also be dispensed and stakeholders should be encouraged to adopt it.
<p>Chapter 4 : Legal Framework for the Management of Chemicals</p>	<ul style="list-style-type: none"> • The DCCA should be revised in some sections to cater for changes in the field of chemical management and to meet the arising challenges on the local market. • Resources should be allocated for more awareness campaigns on the DCCA and its key sections e.g. on classification, labelling and marketing of chemicals. • Capacity needs assessments should be performed to identify the resources required by each enforcing agency of the DCCA. • In parallel, it is also recommended that the Consumer Protection Act and other relevant acts be strengthened for issues pertaining to labelling, chemical composition, warning information, etc. much to the benefit of consumers.
<p>Chapter 5 : Governmental Institutions for the Management of Chemicals</p>	<ul style="list-style-type: none"> • To meet with growing demands for exerting regulatory controls and enforcing relevant legislation such as the DCCA, a dedicated institution may be established in the future so that it can function with permanent staff and all appropriate facilities needed such as infrastructure, logistics, inspection vehicles, etc. to manage chemicals at national level. • There is currently a shortage of permanent staff at the level of the DCCB to deal with all the requirements of the DCCA. Given the importance and the niche nature of the work, it is strongly recommended that additional staff be assigned to ensure continuity. • To promote better preventive measures against chemical related accidents, data collected by different organisations should be more detailed and clustered specifically as chemical-related accidents. • To avoid testing work on similar media being conducted by analytical laboratories of different Ministries, better synergy should be promoted. • More awareness on the specific mandate of each governmental institution (relative to chemical management) should be carried out in order to avoid confusion and waste of resources.

Chapter 6 : Role of Civil Society for the Management of Chemicals	<ul style="list-style-type: none"> • A diverse database of experienced and skilled professionals (from academia and industry) in the different fields of chemical management should be set up. • While training on use and disposal of agrochemicals is common, there is a need for same on other commonly used dangerous chemicals (e.g. industrial and consumer chemicals). • Tertiary institutions dispensing academic courses in chemical management should form joint ventures with private sector operators to ensure that students are offered an academic education coupled with relevant on field experience. The courses should also be re-evaluated and modified in line with market requirements. • There is currently no reporting obligation with respect to chemicals management. Better awareness on the necessity of such reporting should be performed through organisations like Mauritius Chamber of Commerce and Industry (MCCI), Association of Mauritian Manufacturers (AMM) and Joint Economic Council (JCE), • More training should be provided to enable stakeholders to undertake risk assessment in the workplace. • Better coordination should be fostered amongst research institutions (MRC, UoM, etc.) to promote research and technology transfer thereby optimising resources. • NGOs advocating for protection of consumers and environment should be empowered to better voice out the concerns of the population. They should therefore be an integral part of the implementation of Sound Management of Chemical measures.
Chapter 7 : Inter Ministerial Coordinating Mechanisms for the Management of Chemicals	<ul style="list-style-type: none"> • The Dangerous Chemicals Control Act also mentions the existence of an Enforcing Agencies Coordinating Committee (EACC) however, no meetings of this mechanism are currently held. It is proposed that the constitution of the EACC could be modified so as to incorporate representatives of industry groups, workers' groups, the civil society, consumers' associations or women's associations in addition to the technical stakeholders which would normally form part of it. • Deliberations of the DCCB and the DCAC meetings may not always be known to all stakeholders involved in managing chemicals or the public. It is suggested that any major decisions taken on SMC aspects be disseminated in national interest and for better transparency. • The MID Commission which developed from an Inter-Ministerial Coordination Mechanism has so far considered only agrochemicals in its mandate, while other categories of chemicals have not received its consideration. It is recommended that this situation be revised as other sectors of the economy are also vital for the sustainable development of the Republic of Mauritius.
Chapter 8 : National data and International Linkages for the Management of Chemicals	<ul style="list-style-type: none"> • The framework for collection of data/statistics on chemicals should be strengthened throughout the life cycle of the chemicals. This will require key stakeholders to agree on a common platform, confidentiality clauses, resources required and set up the necessary infrastructure to implement the initiative. • All governmental institutions must keep proper records of information pertaining to chemicals. The ways in which information are recorded and reported must be reviewed to ensure critical data is captured in an efficient way. • Mauritius being a signatory of various international Conventions and Agreements, it should make the best use of the resources available for SMC through these conventions as well as through donor agencies. Best practices worldwide should be studied and their applicability in the Mauritian context considered.
Chapter 9 : Technical infrastructure for the Management of Chemicals	<ul style="list-style-type: none"> • A thorough capacity needs assessment needs to be conducted in the testing laboratories operated by the government and necessary provisions made accordingly for their development in line with best practices. • Solutions for the disposal of chemical wastes in government institutions should be looked into by providing specialised services for the collection of stored chemical wastes and their sound disposal. • It is recommended that laboratory testing work be made payable (following a thorough study), as far as practicable, owing to the high running costs of laboratories in terms of chemicals, reagents, CRMs, consumables, apparatus, equipment, etc. • Accreditation of chemical testing laboratories of both public and private sector to the ISO/IEC 17025:2005 Standard should be encouraged through appropriate incentives. • Better synergy should be promoted amongst the governmental labs to optimise resources. Further joint ventures with international/ private labs and research institutes should be encouraged for technology transfer and technical assistance.

<p>Chapter 10 : Awareness and Understanding of Workers and Public for the Management of Chemicals</p>	<ul style="list-style-type: none"> • It is recommended that awareness and training activities are kept recurrent for the public at large and tailored for the audience they are targeted for. NGOs, academic sector and consumer protection groups should be involved in such activities. Awareness should also focus on eco-friendly alternatives to chemicals. • Where necessary, post training assessments should be carried out to gauge the success of the awareness and training delivered. This is particularly valid for working dealing directly with dangerous chemicals. • Short-term courses spanned over a few days to few weeks period can be introduced to increase awareness about chemicals and specifically aimed for people having to sell, transport, handle, store or dispose of chemicals. Training on the Globally Harmonised System (GHS) or other internationally approved systems for labelling should also be considered.
<p>Chapter 11 : Resources for the Management of Chemicals</p>	<ul style="list-style-type: none"> • In the event a centralised governmental institution is created for the management of chemicals, an in-depth capacity needs assessment will be required to determine the resources requirements. • Funds from International donor agencies should be tapped in for the implementation of SMC priorities. Opportunity for training should also be explored. Niche training requirements and providers of such training should also be identified. • All records of training must be properly kept within each institution, as the trained staff may, in turn, need to train other people in specific areas in the future. It is recommended that a proper training database be set up for this purpose.

Figure 12.1 shows the overall goals of SMC implementation in the Republic of Mauritius as a summary of the conclusions and recommendations stated in the previous Chapters.

Figure 12.1 Overall recommendations for SMC implementation



These recommendations are reflective of the nine priority actions which have been accepted during the endorsement of the National Phased Action Plan for the Sound Management of Chemicals in Mauritius. Given the actual constraints that the existing institutions face in the management of chemicals at national level, it is recommended that a dedicated Chemicals Management Authority is set up in the medium term, i.e. around 2016 - 2017. This would require discussions at various levels and as well as a feasibility study to identify the capacity needs, financial resources, and other key aspects such as the legal framework. The Republic of Mauritius being a signatory of SAICM, an international non-binding mechanism, it should be able to adopt the SAICM 2020 goal with efforts put in to manage chemicals. It is finally recommended that the first edition of the National Chemical Profile be revised before the target-year of 2020 as it is expected that the Sound Management of Chemicals would then be considered a higher priority by the Government of Mauritius.

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List of Annexes

- Annex 1** Project Management Team
- Annex 2** Questionnaire for National Survey on Trade on Chemicals in Mauritius
- Annex 3** Application for Licence – Trading in Dangerous Chemical
- Annex 4** Application for Importation of Pesticides
- Annex 5** Application for Registration of a pesticide

Annex 1

The Project Management Team (PMT) for the preparation of the National Chemicals Profile under Mauritius/UNDP/UNEP Partnership for SAICM initiative was as follows:

> **Ministry of Health & Quality of Life**

- > Dr. Ishwarduth Boodhoo, Head, Occupational Health Unit (OHU)/National SAICM Focal Point & National Project Director
- > Dr. (Mrs.) S. Sivapragasam, Senior Occupational Health Physician/Assistant National Project Director
- > Dr. Rakeshwar Goorah, DCCB, Registrar

> **United Nations Development Programme (UNDP)**

- > Mr. Shakil Beedassy, Project Manager
- > Mr. Satyajet Ramchurn, Environment Programme Officer

> **International Chemicals Management Consultant**

- > Mrs. Hilda Van Der Veen, Relements, New York, USA

> **Local Consultants:**

- > Mrs. Pamela Leste – De Périndorge: Senior Economist
- > Mrs. Vimla Esther Hanoomanjee: Health Policy & Institutional Specialist
- > Mr. Shailand K.S. Gunnoo: National Chemical Expert/Environmental Health Expert Annex 2

Annex 2

QUESTIONNAIRE:

Section A: General Information

1. Company name:
2. Year established:
3. CEO /Managing Director:
4. Contact person & designation for this survey:
5. Contact details. E-mail:
6. Phone number:
7. Description of company activities
(please fill out table below)

	Yes	No
(a) Importation for own use (i.e. the company itself is the end-user)		
(b) Importation for use in sister company(ies)		
(c) Importation for sales & distribution to others		
(d) If the answer (c) is Yes, please indicate the purchaser of the chemicals		
(i) Public sector (Ministries & local agencies)		
(ii) Private sector enterprises		
(iv) Individuals		
(v) Others, please specify		
(e) Re-exportation of imported chemicals (only applies to Free Port activities)		

8. Does the company keep records of its clients (database/register) for the supply of chemicals? Yes/No

Section B: Company Employee profile

1. Current number of employees
2. Number of employees who come into contact with chemicals on a regular basis
3. Does your company hire contractual/seasonal employees who come into contact with chemicals? Yes/No
4. To what extent are the company employees aware about risks associated with certain chemicals?

Please use the below rating to answer this question.

1	2	3	4	5	6	7	8	9	10
Not aware at all									Extremely aware

5. Do your employees undergo regular health check-ups? Yes / No

5.1. If the answer 5 is Yes, how often are these done?

6. Are employees who meet with workplace accidents or contract occupational diseases due to chemicals given any follow-up by your company? Yes/No

6.1. If the answer 6 is Yes, kindly indicate what is normally done in the table below. Please tick all that apply.

	Yes	No
(a) Advanced medical attention e.g. scans, further blood tests		
(b) Accident/Medical compensation through insurance cover or special funds.		
(c) Transfer to another working section or department		
(d) Review of processes or working procedures		
(e) Employee's re-education or re-training		
(f) Temporary or Permanent withdrawing of hazardous activities		
(f) Any other measures as deemed fit by the company		

Section C: Information on type of chemical used

1. Kindly fill out the table below with the latest information at your disposal and please attach any additional details in separate sheet(s) if needed.

No.	Description	I/E ¹	Country of origin	Quantities ² used/year	Packaging ² /year	Estimated export/import value (Rs)	Remarks (if any)
1	Pesticides (for agricultural, public health & consumer uses)						
2	Fertilizers						
3	Petroleum products						
4	Industrial (used in manufacturing/processing facilities)						
5	Consumer chemicals						
6	Other chemicals (unknown/mixed use)						

¹Specify 'I' for Imports & 'E' for Exports.

²Specify units applicable, for e.g. tons or litres.

2. Are the imported or exported chemicals subject to bilateral trade agreements or any preferential tariffs? Yes/No

2.1. If the answer 2 is Yes, please specify which ones (e.g. COMESA, SADC or others)

3. Does the company keep extra stocks in-house? Yes/No

4. Are the chemicals traded by your company in accordance to any international standards, guidelines or regulations?

4.1. If the answer 4 is Yes, please specify the source of these international standards, guidelines or regulations in the table below:

Source	Yes	No
(a) World Health Organisation		
(b) Food and Agriculture Organisation		
(c) Globally Harmonized System for Classification and Labelling of Chemicals		
(d) United Nations Environment Programme		
(e) International Labour Organisation		
(f) Organisation of Economic Countries for Development		
(g) World Maritime Organisation		
(h) Good Manufacturing Practices		
(i) Good Laboratory Practices		

(j) Organisation for Prohibition of Chemical Weapons		
(k) United Nations Industrial Development Programme		
(l) International Atomic Energy Agency		
(m) International Standards Organisation		
(n) International Laboratory Accreditation Forum		
(o) Intergovernmental Forum on Chemical Safety		
(p) Any other - Please specify		

Section D: Chemical safety

1. Does your company have a general or specific policy in place to manage chemicals? Yes/No

1.1. If the answer 1 is Yes, please specify

2. Does your company have a Health & Safety Committee? Yes/No

3. Has the company staff received any training on the management of chemicals? Yes/No

3.1 If the answer 3 is Yes, please provide details on the training and the training provider

3.3 How often and/or when are they trained? (e.g. once a year or when they start a new job/position, etc.)

3.3 In which other fields related to chemical safety would you wish your staff be specifically trained in?

4. How does your company ensure that employees/visitors are protected against harmful effects of chemicals?

5. Does your company use & disseminate Safety Data Sheets (SDS) to others e.g. authorities or clients? Yes/No

5.1. If the answer 5 is Yes, kindly indicate in the table below whether the SDS used are:

	Yes	No
(a) always printed in English or French language?		
(b) always submitted to the DCCB prior to clearance of the chemicals from the Customs Department ?		
(c) kept in administrative registers and office files only ?		
(d) kept at specific working places where chemicals are actually used?		
(e) communicated to staff (including drivers of vehicles transporting chemicals) in a language that they understand?		
(f) always handed over to clients while chemicals at delivery time ?		

5.2 If the answer 5.1 (f) is No, please specify any other ways in which SDS are disseminated to clients?

6. Does the company provide (technical) advice to its clients on how to properly manage chemicals? Yes/No

6.1 If the answer 6 is Yes, how does it do that?

7. Does the company have any response plan for emergency situations like accidents, spillages, leaks or fires, which involve chemicals? Yes/No

7.1 If the answer 7 is Yes, how often is this plan subject to reviews?

8. Does your company employ the following persons? Kindly fill out the table below

	Yes	No
(a) Health & Safety Manager/Officer (part-time or full-time basis)		
(b) In-house Nursing/Medical Officer		
(c) Visiting Nursing/Medical Officer		
(d) Production/Chemical Engineer		

9. Does your company maintain periodic records of incidents and accidents caused due to chemicals? Yes/No

9.1. If the answer 9 is Yes, how many such incidents or accidents has your company recorded over the past 3 years?

If exact figures are not available, provide an estimate.

10. Does your company maintain periodic records of occupational diseases contracted by workers as a result of exposure from chemicals? Yes/No

10.1 If the answer 10 is Yes, how many such occupational diseases has your company recorded over the past 3 years?

If exact figures are not available, provide an estimate.

Section E: Available Logistics

1. Please indicate the related facilities that your company has at its disposal by filling out the below table:

Description of facilities	Yes	No
1.1 Designated storage area(s) for chemicals (e.g. chemical stores, warehouses, etc)		
1.2 Company vehicles for transport of chemicals by road		
(a) If the answer 1.2 or 1.3 is/are Yes, what type of vehicles are these?		
(b) If vehicles are used, what precautionary/warning information do they provide to other road-users by virtue of their hazardous consignments, for e.g. use special inscriptions, flashlights, etc.?		
(c) Is special training provided to drivers and other employees involved in the transportation and distribution of chemicals to clients?		
1.4. Designated area for processing/repackaging/production of chemicals		
1.5. Testing laboratory		
1.6. Waste water treatment facility		
1.7. Designated (disposal) area for empty chemical containers, obsolete chemicals or chemical wastes		

2.1 Do all of the above mentioned facilities carry proper safety signage?

2.2. If the answer 2.1 is No, how can safety warnings be better arranged then?

Section F: Applicable legislations

• Please indicate in the table below the Acts which your company must abide to, for imports/exports of chemicals.

Legislation	Yes	No
1.1 Dangerous Chemicals Control Act		
1.2. Customs Act		
1.3. Consumer Protection Act		
1.4 Occupational Safety & Health Act		
1.5. Plant Protection Act		
1.6. Dangerous Drugs Act		
1.7 Environmental Protection Act		
1.8 Food Act		
1.9 Freeport Act		
1.10 Chemical Fertilizer Act		
1.11 Radiation Protection Act		
1.12 Dangerous Weapons Convention Act		
1.13 Road Traffic Act		
1.14 Fire Services Act		
1.15 Inflammable Liquids & Substances Act		
1.16 State Trading Corporation Act		
1.17 Any other - Please specify		

2. Does your company trade in chemicals which are restricted or extremely dangerous chemicals, etc. as stipulated in specific schedules of the above list of legislations? Yes/No

2.1 If the answer 2 is Yes, please indicate the specific schedules and applicable legislations?

3. How often do regulatory or enforcing authorities conduct visits to your company?

3.1 What is/are the purpose/s of such visits? (*kindly fill out the table below*):

Purpose	Yes	No
(a) Workplace inspections		
(b) Accident Inspections		
(c) Fire-prevention inspections		
(d) Inspections on machinery & processes		
(e) Pollution control & monitoring		
(f) Any other official ones, please specify		

4. Has your company ever received any warnings, notices or fines in case of non-respect to legislations pertaining to chemicals? Yes/No

4.1 If the answer 4 is Yes, for what in particular, were the warnings, notices or fines issued for?

Section G: Chemical registration for trading

- How many permits for trading of dangerous and extremely dangerous chemicals does your company apply for annually?
- What is the total cost borne by your company for registration of chemicals annually (In Rs)?
- Describe any difficulties or challenges that your company encounters during registration of chemicals for local trade or re-exporting?
- How do you think that the chemical registration process can be made easier in Mauritius?

Section H: Obsolete Chemicals and Wastes

1. Does your company presently have in stock any unsold or unsupplied chemicals, which turned obsolete with time, or chemical wastes? Yes/No

1.1 If the answer 1 is Yes, please indicate in the table below, what eventually happens with these surplus chemicals or wastes generated (*tick as many as apply*):

Fate description	Yes	No
(a) Stored on the premises in original containers as imported		
(b) Stored on the premises in new containers bearing proper labels for their contents		
(c) Stored on the premises without any labels		
(d) Sent to the Transfer Station (municipal landfill)		
(e) Sent to the Hazardous Waste Cell at Mare Chicose Landfill		
(f) Sent to a recycling/disposal company for treatment		
(g) Ship back to original suppliers abroad		
(h) In case of any other means of disposal, please describe the fate:		

2. Has the company provided any assistance to clients having current stocks of obsolete chemicals or wastes in their possession? Yes/No

2.1. If the answer 2 is Yes, what kind of assistance was provided?

Section I: Environmental Consciousness

1. Has your company ever received any complaints for chemicals or chemical wastes expressed by the general public or nearby communities (e.g. nuisances due to bad odors, improperly disposed of wastes, chemical spills) Yes/No

1.1 If the answer 1 is Yes, how did the company respond to such complaints?

2. Because of environmental concerns, has your company stopped the imports and supply of any chemicals including mixtures, preparations or formulations? Yes/No

2.1 If the answer 2 is Yes, which chemicals were these specifically?

3. Has the company been subject to an Environmental Impact Assessment (EIA)? Yes/No

4. Has the company introduced any environmentally friendly initiative(s) in the last 3 years? Yes/No
If the answer 4 is Yes, what were these initiatives?

5. How often does your company obtain requests to shift to environmental-friendly substitutes of chemicals posing any risks?

6. Has your company ever received official recognitions for its operations in relation to sound practices of imports, exports, storage, transportation or distribution of chemicals? Yes/No

6.1. If the answer 6 is Yes, which ones?

Section J: Financial data

Please provide your Company turnover (Rs) as requested below:

2009	2010	2011	2012

Please provide you're the amount in Rs of Taxes and duties (Custom duties, VAT, Corporate tax, CSR) paid by your company as requested.

2009	2010	2011	2012

Section K: Additional information

1. With respect to the management of chemicals in Mauritius is there any particular information you wish to share in this survey?
2. What do you think is the most challenging aspect of chemicals management for your company?
3. Does your company have any suggestions or recommendations to improve the management of chemicals in Mauritius?
 - 3.1 If the answer 3 is Yes, please provide details.
4. What do you think is the most challenging to deal with as a company with respect to the management of chemicals?

Name :

Date:

THANK YOU FOR YOUR TIME AND COLLABORATION

Republic of Mauritius

MINISTRY OF HEALTH & QUALITY OF LIFE

DANGEROUS CHEMICALS CONTROL BOARD

(ACT NO. 16 OF 2004)

APPLICATION FOR LICENCE

TRADING IN DANGEROUS CHEMICALS

1.APPLICANT	
1.1 NAME OF COMPANY/APPLICANT	
1.2 Status (Importer/Exporter)	
1.3 Physical Address	
1.4 Postal address	
1.5 Telephone:	
1.6 Fax:	
1.7 E-Mail:	
1.8 Contact Person/Technical person Qualification Knowledge and experience in Chemicals	
2. Is this your first application? Yes/No*	
2.1 Registration Number (If No)	
3.Nature of trade Import Export Manufacture Sell Store Distribute Trade in (Indicate as appropriate)	
4. Identity of Dangerous Chemical Industrial Chemical Agricultural Chemical Consumer Chemical Others (Specify) (Indicate as appropriate)	
4.1 Annex list of all products by category(ies) and details (dangerous chemicals, extremely dangerous chemicals, pesticides) List all active ingredients in case of mixtures.	
4.2 Intended use/s Describe briefly the most important hazards the substances present to man and the environment	
5 Information on the Import/Export*	
5.1 Expected Date of first Import/Export*	
5.2 Name of Manufacturer	
5.3 Country from which consigned	
5.4 Name of Exporter/Supplier	
5.5 Import/Export* Amount	
5.6 Name, address & Country of Consignee	

6. Storage	
6.1 Provision for storage facilities: Yes/No*	
6.2 Location of Storage (Annex plan for new application)	
6.3 Other clearances in respect of the nature of application: (Applicable for new applications)	
6.3.1 EIA Licence	
6.3.2 Development permit	
6.3.3 Fire Clearance	
6.3.4 No objection from neighbours	
6.3.5 Police Clearance (Submit copy of all documents)	
7. Declaration	
I certify that all information provided on this application and all attachments are true, complete and correct to my knowledge.	
6.2 Location of Storage (Annex plan for new application)	
..... Name in full & Official Title Signature
Date	Official Stamp of Applicant/ Company

N.B:

The Board may require an applicant to furnish such additional information as may be required to determine the application. Incomplete filling of form may cause delay in processing of application.

Republic of Mauritius

MINISTRY OF HEALTH & QUALITY OF LIFE
DANGEROUS CHEMICALS CONTROL BOARD

APPLICATION FOR IMPORT OF PESTICIDES

Section 11 and Second Schedule Part II

1. Trade Name:
2. Common Chemical Name:
3. CAS Number:
4. Customs Tariff (HS) Code:
5. Chemical Type (Organophosphate, Carbamate, Pyridril, etc):
6. Active Ingredients:
7. Classification by hazard:
(WHO Classification)
8. Formulation/Concentration (g/l, g/kg):
9. Type of formulation (EC,EW,DP,CS,SC, etc):
10. Use category (Insecticide, Herbicide, Fungicide,others.):
11. Pests against which its use is approved:
12. Mode of action (Contact, stomach, systemic, etc.):
13. Crops on which its use is approved:
14. Toxicity: (i) Oral
(ii) Dermal
(iii) Skin and eye irritation
(iv) Allergic sensitisation
(v) Inhalation
15. Direction for safe use (protective equipments):
16. Safety interval:
17. Antidote:
18. Type of packaging material in which product to be imported and distributed:
19. Country of Origin:
20. Name of manufacturer/Supplier:
21. Quantity to be imported:
22. Date and Number of Previous import permit issued by D.C.C.B:

NAME OF APPLICANT:.....

STATUS:.....

SIGNATURE:.....

DATE:.....

SEAL OF COMPANY

- > Photocopy of SDS should accompany this application.
- > Photocopy of trade licence

Republic of Mauritius

**MINISTRY OF HEALTH & QUALITY OF LIFE
DANGEROUS CHEMICALS CONTROL BOARD**

Atchia Building, Port Louis

**DANGEROUS CHEMICALS CONTROL ACT 2004
(ACT NO.16 OF 2004)**

APPLICATION FOR THE REGISTRATION OF A PESTICIDE

INFORMATION FOR APPLICANTS

1. The application form must be duly completed in all respects. Where applicable, the requested information should be submitted as separate numbered attachments.
2. The application and draft label must be submitted in 17 copies with an explanatory covering letter.
3. Every application must be accompanied by the prescribed fee.
4. Supportive studies (e.g. toxicological data, efficacy data, residue data, physical specifications, etc.) must be submitted.
5. Lists I and II are supplied as check lists and an index to ensure that the applicant has provided all relevant data.
6. The Board may require the applicant to furnish such additional information as may be required to determine the application.

Indicate where appropriate

A Pesticide containing a new active ingredient

B Pesticide where source of active and/or formulation is not identical to that of a registered product:

C Registration transfer:

D Amendments to existing registrations:

E Other:

1. APPLICANT		
Identification	Name / Corporate name of company Reg.No. (of registration holder)	Name of distributor/agent in country
Status(importer, formulator, distributor)		
Physical address		
Postal address		
Telephone		
Fax:		
e-Mail		
2. PRODUCT		
Designation	Trade Name:	
	Trade mark holder:	

Function of the product:			
Intended use: veterinary, public health, industrial, agriculture, forestry, etc.)			
Target pest(s) and host(s)			
Method, dosage, rates and frequency of application: (if required)			
Type of formulation:			
Existing reg. no.: (if relevant)			Customs Tariff Code:
Registration in other countries: (please indicate)			
Is the product registered in country of manufacture and formulation:		If not, Why not?	If yes, submit evidence
3. ACTIVE INGREDIENT(S)(Technical grade) (may be attached in sealed envelope)			
Active ingredient(s): (Common name/s)	Manufacturer: (Name and address)	Min a.i.% purity:	Range %
4.FORMULATION			
Formulator: (Name)		Address:	
Composition (may be attached in sealed envelope)			
Ingredients and Function:	g/l	g/kg	Range
5. TOXICOLOGY(formulated product)			
RAT:	Acute Oral (LD ₅₀ mg/kg)	Acute Dermal (LD ₅₀ mg/kg)	Inhalation LC ₅₀ (mg/l/hour)
	Experimental	Experimental	Experimental
	Calculated	Calculated	Calculated
RABBIT:	Skin irritation		Eye irritation
None			
Mild			
Moderate			
Severe			
Sensitisation in guinea pig:	None	Mild	Moderate Severe
WHO class	Ia	Ib	II III
Summary of other Mammalian Toxicological Studies:			
Summary of Environmental Effects:			
Toxicity to bees:			
Toxicity to fish and other aquatic organisms:			
Toxicity to birds:			
Toxicity to earthworms and soil micro organisms:			
Toxicity to other non-target organisms:			
Persistence in environment:			
Other effects:			

6. PACKAGING	
Packaging material/container:	
Pack size(s):	
Disposal of empty container(s):	
7. DECLARATION	
For and on behalf of.....	
I hereby certify that the above mentioned information and data in support of this application are to the best of my knowledge true, correct and complete.	
Name in full & Official Title(printed)	Signature
Date	Official Stamp of Applicant/Company

LIST I ACTIVE INGREDIENT: DOSSIER INDEX

The dossier accompanying the form should provide details of the information requested in the form i.e. details on the method used (physical & chemical), summaries of the methods and results used in toxicology and ecotoxicology studied, methods of analysis etc. Numbering used in the dossier must follow that used in the application form.

If the product contains more than one active ingredient, compile a separate dossier for each active ingredient.

ACTIVE INGREDIENT(a.i.) (Technical Grade)	Annex No. in dossier if study included	Official use only
1. DESIGNATION		
a. Common name (ISO)		
b. Manufacture or development code		
c. Chemical name (IUPAC)		
d. Chemical group		
e. Structural formula		
f. Empirical formula		
g. Patent status Is the a.i. under patent? Who is patent holder? Expiry date		
2. PHYSICAL AND CHEMICAL PROPERTIES (active ingredient-technical grade)		
a. Physical state		
b. Colour		
c. Odour		
d. Density at 20°C		
e. Vapour pressure at 20/25°C		
f. Volatility		
g. Hydrolysis DT ₅₀Days.....°C.....pH		
h. Photolysis		
i. Solubility in water.....°C.....pH		
j. Solubility organic solvents		
k. n-octanol/water partition coefficient		
l. Boiling point °C		
m. Melting point °C		

l. Boiling point °C			
m. Melting point °C			
n. Decomposition temperature °C			
o. Method of Analysis and Impurities			
3. TOXICOLOGY (Active Ingredient – technical grade)			
a. ADI			
b. Acute oral LD ₅₀ mg/kg rat/rabbit			
c. Acute dermal LD ₅₀ mg/kg rat			
d. Inhalation LC ₅₀ mg/l/hour (rat)			
e. Skin irritation (rabbit)			
f. Eye irritation (rabbit)			
g. Sensitisation (guinea pig)			
h. Reproduction (specify species)			
i. Subchronic toxicity 90 day NOEL mg/kg/day			
j. Chronic toxicity NOEL mg/kg/day			
k. Carcinogenicity (life time)NOEL mg/kg/day			
l. Neurotoxicity NOEL mg/kg/day			
m. Teratogenicity NOEL mg/kg/day			
n. Mutagenicity/Genotoxicity			
o. Metabolism (rat)			
p. Other studies			
ACTIVE INGREDIENT Technical grade)		Annex No. in dossier if study included	Official use only
4. ECOTOXICOLOGY (Active ingredient – technical grade)			
a. Birds (2 species)	LD ₅₀ mg/kg		
	NOEL		
	LD ₅₀ mg/kg		
	NOEL		
	Reproduction		
b. Fish (2 species)	LD ₅₀ mg/kg		
	NOEL		
	LD ₅₀ mg/kg		
	NOEL		
	Reproduction		
	BCP		
c. Daphnia	LC ₅₀ mg/l		
	NOEL		
d. Algae	LC ₅₀ mg/l		
	NOEL		
e. Bees	LD ₅₀ μg/bees		
	NOEL		
f. Earthworms	LC ₅₀ mg/kg		
g. Soil micro-organisms	EC/LC ₅₀ /mg/kg		

5. BEHAVIOUR IN ENVIRONMENT (active ingredient – technical grade)		
Behaviour, ways of degradation, degradation products in soil		
a. Major metabolites		
b. DT ₅₀ (days)		
c. Mobility		
d. Adsorption		
e. Mobility of metabolites		
Behaviour, ways of degradation, degradation products in water		
f. Major metabolites		
g. DT ₅₀ (days)		
h. Surface		
i. Ground		
6. MODE OF ACTION		
7. RESIDUES IN PLANTS		
a. Major metabolites		
b. Metabolism		
c. Behaviour of residues		
d. Crop		
e. MRL codex		
f. MRL country		
g. PHI & MRL proposed		
h. Method of residue analysis		
COUNTRY SPECIFIC REQUIREMENTS		
a.		
b.		
c.		
d.		
e.		

LIST II
FORMULATED PRODUCT: DOSSIER INDEX

The dossier accompanying this form should provide more details of the information requested in the list i.e. details on the methods used, applicants are advised to use CIPAC methods for Phys./Chem. Properties, summaries of the methods and results used in toxicology and ecotoxicology studies, method of analysis etc. Numbering used in the dossier must follow that used in the application form.

FORMULATED PRODUCT	Annex No. in dossier if study included	Official use only
1. PHYSICAL AND CHEMICAL PROPERTIES		
a. Physical state/formulation type		
b. Colour		
c. Odour		
d. Storage stability		
e. Shelf life		
f. Density		
g. Bulk density		
h. Flammability		
i. Flash Point		
j. Compatibility with other pesticides		
k. pH		
l. pH of 1% aqueous dilution		
m. Oxidizing properties		
n. Corrosiveness		
o. Water content		
p. Wettability		
q. Solubility in water		
r. Foaming		
s. Particle size		
t. Suspensibility/emusifiability		
u. Emulsion stability		
v. Volatility		
w. Viscosity		
x. Other properties(where applicable)		
y. Method of analysis		
2. TOXICOLOGY		
a. Rat Acute oral LD ₅₀ mg/kg		
b. Acute dermal LD ₅₀ mg/kg		
c. Inhalation LC ₅₀ mg/l/hour		
d. Rabbit Skin irritation		
e. Eye irritation		
f. Sensitisation in guinea pig		
g. WHO classification		
h. Other studies		

FORMULATED PRODUCT	Annex No. in dossier if study included	Official use only
3. EMERGENCY PROCEDURES IN CASE OF ACCIDENTAL EXPOSURE OR POISONING		
a. Symptoms of human poisoning		
b. First aid treatment		
c. Skin contact		
d. Eye contact		
f. Ingestion		
g. Antidote		
h. Note to physician		
4. EMERGENCY PROCEDURES I CASE OF FIRE/SPILLAGE		
a. Fire fighting measures		
b. Procedures in case of spillage		
5. USES (New label claims with the application)		
a. Crop/area of use		
b. Target organism		
c. Rate		
d. Stage of treatment		
e. Directions for use		
f. Residue data and pre-harvest interval		
g. Phytotoxicity		
h. Contraindications		
6. MINIMUM LABEL REQUIREMENTS		
a. Product identification		
b. Warning and use restrictions		
c. Safety precautions		
d. First aid/note to physician (as applicable)		
e. Pictograms (if applicable)		
f. FAO colour code (if applicable)/group		
g. Directions for use		
COUNTRY SPECIFIC REQUIREMENTS		
a.		
b.		
c.		

