NATIONAL CHEMICAL PROFILE OF VANUATU

2021

Department of Environmental Protection and Conservation
Ministry of Climate Change Adaptation, Meteorology,
Geo-Hazards, Environment, Energy and Disaster Management
Government of Vanuatu

Supported by

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Government of Vanuatu
Port Vila
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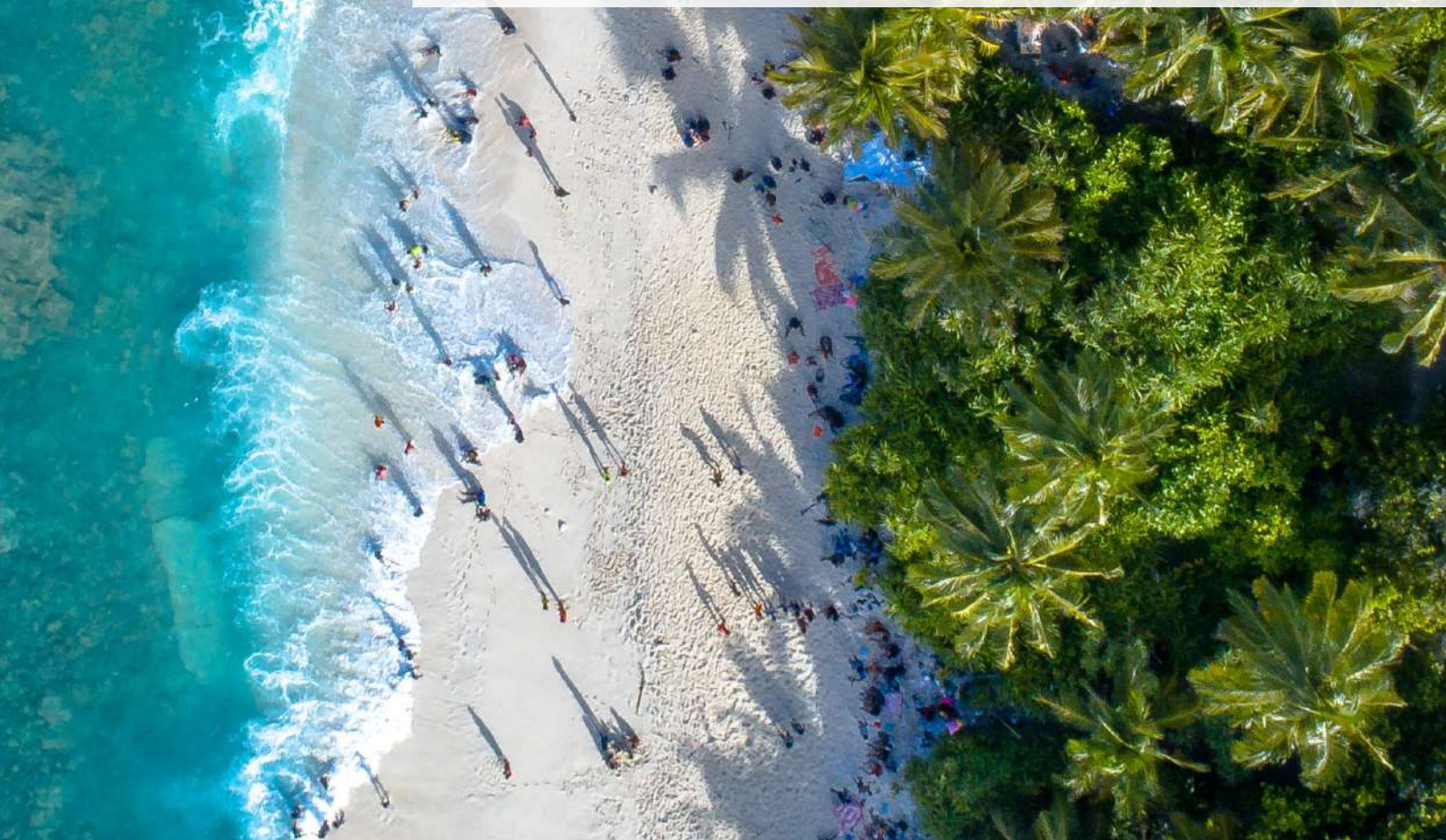

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List of Acronyms

DEPC	Department of Environmental Protection and Conservation
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
IFCS	Intergovernmental Forum on Chemical Safety
ILO	International Labour Organization
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPCS	International Program for Chemical Safety
NCCC	National Chemicals Coordination Committee
NIP	National Implementation Plan
NWMPCSIP	National Waste Management and Pollution Control Strategy and Implementation Plan
OECD	Organization for Economic Co-operation and Development
POPs	Persistent Organic Pollutants
SAICM	Strategic Approach of International Chemicals Management
SMCW	Sound Management of Chemicals and Waste
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCEDTG	United Nations Economic and Social Council's Committee of Experts on the Transport of Dangerous Goods
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
WHO	The World Health Organization

Foreword

Vanuatu is a small island Developing State and has over 80 islands, most of which still retain much of their original nature. It has a population is 300,019 people. Vanuatu has the challenge to protect as much as possible its environment from hazardous substances.

The Vanuatu government wishes to acknowledge and thank the Global Environment Facility (GEF) donors of the UNEP Special Programme who funded the project "Strengthening the Institutional Capacity for Chemicals and Waste Management in Vanuatu of which, one of the components is to develop the Vanuatu National Chemical Profile (NCP).

The Vanuatu government also acknowledges the consultant, Dr Krishna Kotra of The University of the South Pacific and his team for the compilation of the Vanuatu NCP, and also thank the National Chemical Coordinating Committee (NCCC) for their contributions to the profile. I also extend my sincere appreciation for all stakeholders for their time and data.

The Vanuatu NCP is showing the government that, there is a large number of various chemicals being imported into Vanuatu, some of which if not monitored on their use and disposal, they can have very negative impacts on Vanuatu's environment.

The Vanuatu government is looking forward to have in place measures to manage the import, use and disposal of chemicals and their wastes in Vanuatu.

Donna Kalfatak
Director
Department of Environmental Protection and Conservation

Executive Summary

This consultancy report is part of the development of "Vanuatu's National Chemicals Profile" which is one of the different components of the project "Strengthening the national institutional capacity for chemicals and waste management in Vanuatu". The objective of the project is to support country-driven institutional strengthening at the national level, in the context of an integrated approach to address the financing of the efficient management of chemicals and wastes, taking into account the national development strategies, plans and priorities of Vanuatu, to increase sustainable public institutional capacity for the sound management of chemical and wastes throughout their life cycle. Institutional strengthening under the Special Programme will facilitate and enable the implementation of the Basel, Rotterdam, Stockholm and Minamata conventions and the Strategic Approach of International Chemicals Management (SAICM).

Dr Krishna Kumar Kotra working at The University of the South Pacific had carried out this consultancy work for Department of Environmental Protection and Conservation (DEPC). In developing the National Chemical Profile of Vanuatu, stakeholder meetings, data collection, site visits etc. were done during August 2020 and March 2021. As expected, the data collection part was difficult due to lack of proper records and non-supply of data from some stakeholder's in-spite of several requests. Thus, the current documentation was limited to all available data that is being supplied by various stakeholders and from Customs and Inland Revenue. The collected data shows that Vanuatu is an importer of chemicals but not a supplier.

An average of 2,031 Million Vatu imports were done for chemicals and allied products for the years 2018-2020 with over 2,000 Million Vatu for each year. The mineral imports for the same period are 11,030, 9,987 and 6,475 Million Vatu. Most of the chemical imports are for general usage in various sectors of industries and for household purposes.

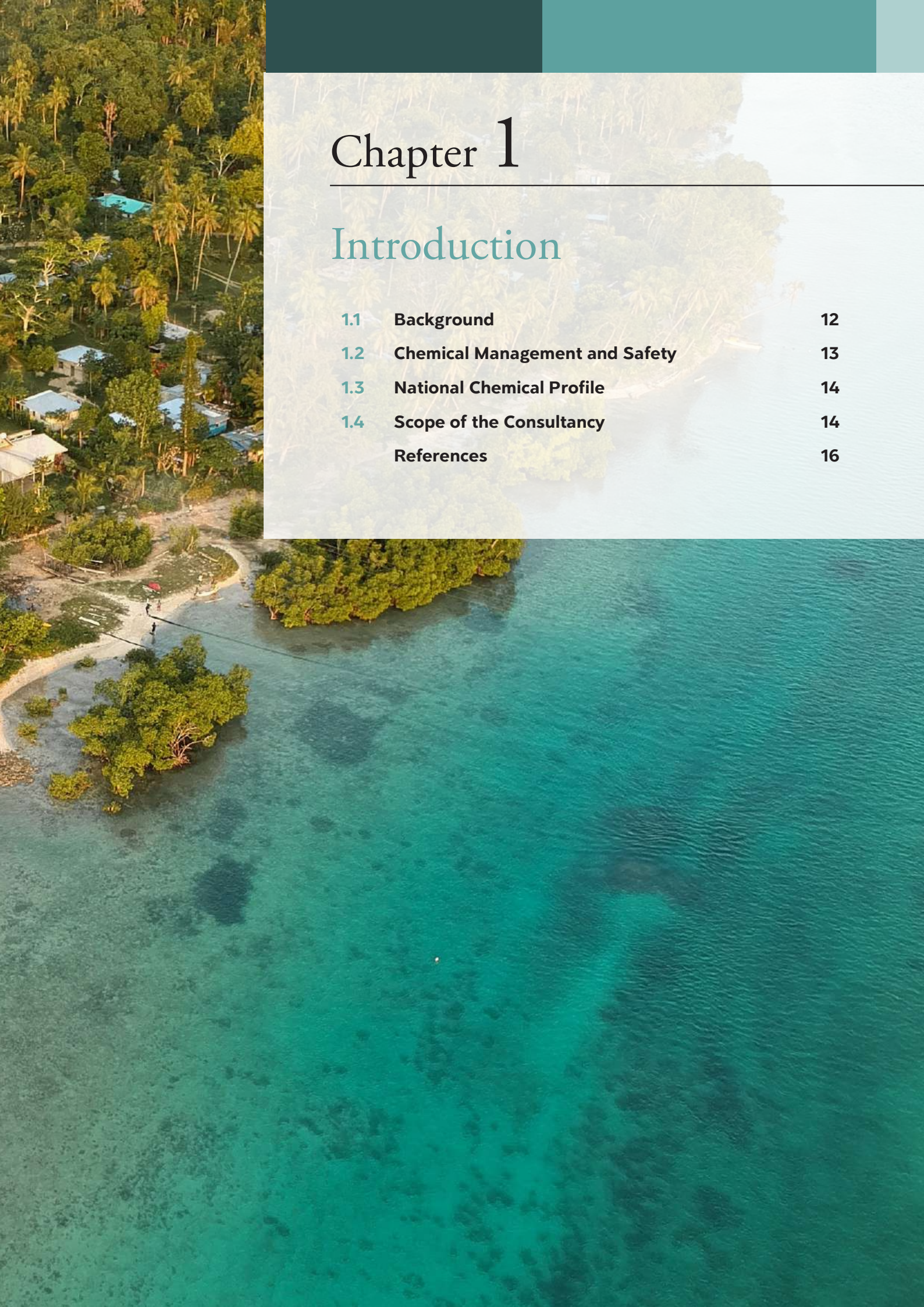
Even though, Vanuatu being part of many conventions over the years, there seems lack of some components of these frameworks being not implemented to a full spirit. There are multiple reasons being brought forward which include political, administrative, human resources, expertise and financial constraints. The implementation of the safe management and disposal of chemicals in the country was found as a non-monitored programme. It was not noted that many storage

sites do lack any emergency response equipment nor trained staff. There is very limited knowledge in regard to chemical storage, usage and discharge. These underlines an urgent need to frame proper legislation with administrative support for the monitoring program to track the life cycle of all chemical imports. The program should also include the protocols needed to follow for transport, storage and safe disposal. It is recommended that there is a need also for promotional activities for safe usage and storage of chemicals/chemical related products. To achieve this, the consultant recommends strengthening DEPC's capacity by establishing "Chemicals Monitoring Officer".

In-spite of Customs and Inland Revenue Department do track the chemical imports as raw material or in bulk quantities, there are multiple anomalies being observed in the data entry. There is no other proper track of chemicals there onwards either in their usage/storage/disposal by various end users in the country. This clearly calls for an urgent need to develop appropriate legislations that enable proper record maintenance by stakeholders. Added, a National Chemical Management Database to track the flow of these in the country should also be established. Furthermore, proper legislation for transport, storage, usage and discharge should be established for the sound management of chemicals in the country. Alongside, trainings and workshops for staff of DEPC and stakeholders are also strongly recommended, as there are currently none being implemented in the country.

The consultant believes that here is an urgent need to establish a National Chemical Testing Laboratory to regularly test various water/soil/air samples for chemical constituents for maintaining a sustainable environment in Vanuatu. These regular analyses would align to enable to further strengthen SDG 3, Good Health and Well-being and also SDG 6, Clean Water and Sanitation.

It is hoped that by considering the recommendations and plan to implement the recommendations would strengthen and track in achieving Sustainable Development agenda for 2030 of Sound Management of Chemicals and Waste under SDG 12, Sustainable Consumption and Production.



Chapter 1

Introduction

Introduction

This chapter discusses the evolution of international organizations for chemical management and safety. Further a brief background of the need and tasks of the consultancy were presented.

1.1 Background

Human discoveries and inventions in the chemical field have had good and bad impacts for the environment and human well-being. The scientific revolution took place during the sixteenth and seventeenth centuries while the chemical revolution took place during the seventeenth and eighteenth centuries (Eddy et al., 2014). The works of Antonie Lavoisier's (father of modern Chemistry) during the eighteenth century further extended the revolution and laid strong foundations for modern Chemistry (ACS, 1999). The boon of industrialization also gave birth to new chemical combinations and massive waste generation and as decades passed by it started to end up as a curse. The chemical industry was not a leading creator of public nuisances at the turn of 20th century, but by 1920 it had distinguished itself as capable of producing a number of waste products, both gaseous and liquid, that were both unpleasant and noxious (Colten, 1994). The OECD Environmental Outlook to 2050 predicted that the world chemical production (sales) reaches to fifteen thousand billion US$ (2007 rate) (OECD, 2012). The growth of the industry slowly generated several environmental changes where by most living on the earth had its impacts in one way or the other. Especially the chemical waste deposits and their byproducts with their freelance movement in the environment through air/water/soil have been increasingly threatening the survival of all the living. The Toxics Release Inventory (TRI) of United States Environmental Protection Agency (EPA) based on the criteria of cancer and chronic human health and environmental effects has listed 770 individual chemicals and 33 chemical groups (EPA, 2019).

Chemical usage and storage accidents have been reportedly increased, with associated human costs and property loss, in addition to environmental damage. Over 20,000 people are estimated to have died and 120,000 chronically ill survivors with 500,000 registered victims from the ill-famed Bhopal gas tragedy that took place in India in 1984 due to the leakage of 41 tons of Methyl isocyanide and till today its impacts are evident from genetic disorders (Dinham & Sarangi, 2002; Mishra et al., 2009). The explosion in Toulouse, Southern France in 2001 resulted in 29 deaths and about 2,500 injuries, causing losses of more than €2.3 billion (approximately equivalent to US$2.59 billion); and more recently in 2018, Tianjin Port 8.12 fire and explosion accident in China led to 165 fatalities and 798 injuries, with direct economic losses of CNY6.866 billion (approximately equivalent to US$1 billion) (Du et al., 2020). In just one generation the production of man-made chemicals has increased by 40,000% and we produce 400 tons of hazardous waste each year (theworldcounts.com). It is estimated that over 180 million tons of mine wastes containing arsenic, lead, mercury, cyanide and over thirty other dangerous chemicals are dumped into oceans, rivers and lakes every year (Sampat, 2012). The above out of many reported clearly indicate the need for sound management of chemicals in not only safe guarding human exposure but to protect the fragile environment around the usage and storage sites.

As the public uproar started in some parts of the world over the visible damages of chemical contamination, especially in water resources and was generally considered as the first known discussion of chemical impact in environment. By 1905 US federal government made statute law that defined certain offensive industrial activities as nuisance-causing to the environment, especially refereeing to their impact on water resources (Goodell, 1905). As chemical concerns wide spread all over the world, countries started to concentrate on protocols in production, usage, export, and disposal of various chemical substances. In-spite of legislations and administrative overview, new challenges in the safe management never ended. For example, generic product trade names have been substituted in the public domain for more specific and informative chemical names; it has been difficult for those who use chemicals, or for third parties, to undertake the task of data collection (Lyndon, 1989).

1.2 Chemical Management and Safety

The United Nations Conference on the Human Environment, held in Stockholm in 1972, recommended that programs be undertaken for early warning and prevention of the deleterious effects of the various environmental agents, acting singly or in combination, to which man is increasingly exposed. It also recommended the assessment of their potential risk to human health, with particular regard to the risk of mutagenicity, teratogenicity, and carcinogenicity. At the Thirtieth World Health Assembly (1977) Member States considered that the growing use of chemicals in public health, industry, agriculture, food production, in the home together with environmental pollution resulting from rapid industrialization and new technologies would need recognition in the health policies and strategies of all countries (WHO, 1984). The Thirty-first World Health Assembly (1978), after considering the report of the Director-General of WHO, passed Resolution WHA31.28 endorsing the proposal to implement the Program through a central WHO unit at headquarters for planning and coordination, and a network of institutions that would be assigned specific tasks. The International Program on Chemical Safety (IPCS) was established in a response to the challenge posed by the widespread use and disposal of old and new types of chemicals throughout the world to the health of present and future generations (WHO, 1984).

The principal objectives of the IPCS are:

a. to carry out and disseminate evaluations of the risk to human health from exposure to chemicals, based on existing information and data;
b. to encourage the use and improvement, and in some cases the validation, of methods for laboratory testing and epidemiological studies that are suitable for health risk evaluations and propose appropriate methods for assessing health risks, hazards, benefits and exposure;
c. to promote effective international cooperation with respect to emergencies and accidents involving chemicals; and
d. to promote training of the manpower needed for testing and evaluating the health effects of chemicals and for the regulatory and other control of chemical hazards.

The United Nations (UN) Conference on Environment and Development held in 1992 (Rio Conference), Heads of States from 150 member countries of the UN adopted the Agenda 21, a comprehensive document outlining the responsibilities of the States towards the achievement of Sustainable Development. It is aimed in addressing the strengthening of co-operation and increase in international co-operation in the field of chemical safety. The Chapter 19 of the Agenda 21, "Environmentally Sound Management of Toxic and Dangerous Products" included recommendations for achieving the sound management of chemicals by the year 2000. The Intergovernmental Forum on Chemical Safety (IFCS) was established in 1994 to move forward by discussing activities and priorities among members. The Chapter 19 constitutes six program areas. They include, international assessment of chemical risks; harmonization of chemical classification and labeling; information exchange on chemicals and chemical risks, risk reduction; strengthening national capacities and capabilities for chemicals management; and prevention of illegal international trade in toxic and dangerous products.

The Programme Area E on Strengthening of National Capabilities and Capacities for Management of Chemicals is of particular relevance to countries that are in the process of establishing or improving their national systems for chemicals management (UNITAR, 1997). It provides a list of basic elements of national chemicals management, namely:

- adequate legislation
- information gathering and dissemination
- capacity for risk assessment and interpretation
- establishment of risk management policy
- capacity for implementation and enforcement
- capacity for rehabilitation of contaminated sites and poisoned persons
- effective education programs and
- capacity to respond to emergencies

The Inter-Organisation Programme for the Sound Management of Chemicals (IOMC) was established in 1995. The cooperative agreement of IOMC include United Nations Environment Programme (UNEP), the Food and Agriculture Organization of the United Nations (FAO), the International Labour Organisation (ILO), United Nations Industrial Development Organisation (UNID), The World Health Organisation (WHO) and the Organisation for Economic Co-operation and Development (OECD). IOMC is aimed to promote co-ordination of the policies and activities among participating organisations for safe management of chemicals for human health and sustainable environment. In 1996, Pilot Programme to Assist Countries in Implementing National Action Programmes for Integrated Chemicals Management was launched by the United Nations Institute for Training and Research (UNITAR) and IOMC

with financial support from Swiss government (UNITAR, 1997). It is well known that implementation of national level program needs a collective effort from various stakeholders. UNITAR recognised that there will be challenges related to institutional, technical, legal and administrative that would define the implementation and sustainability of aspects related to chemicals management and safety. To implement these in developing countries is another level of challenge.

As part of the Pilot Programme, a guidance document was prepared in 1997, "Planning and Implementing a National Action Programme for Integrated Chemicals Management". The IFCS during its second session in 1997, recommended, "Encouragement of UNITAR/IOMC and partner countries to actively involve non-governmental groups in the planning and implementation of the chemical management. In September 2015 the United Nations General Assembly adopted 17 Sustainable Development Goals (SDGs). Under SDG 12 on Sustainable Consumption and Production, Sound Management of Chemicals and Waste (SMCW) is a specific target to reach by 2030. SMCW is also related to other SDG's like "3" on Good Health and Well-being and "6" on Clean Water and Sanitation. Chemicals and wastes are essential for the implementation of goals poverty reduction, health, gender, water, cities, oceans, food and sustainable consumption (Terekhova, 2016). It is indispensable that the ever increasing usage and deposits of chemical has been arguably one the most concerned topic and international attention is very increasing to find sustainable ways to limit in many ways. It is now widely recognised that chemicals need to be managed properly in order to achieve a sustainable level of agricultural and industrial development and a high level of environmental and human health protection (UNITAR, 2012).

1.3 National Chemical Profile

The IFCS, during its second session in Ottawa, Canada in February 1997, issued a recommendation reinforcing this approach which "Encourages countries to prepare and continuously update national profiles, using the UNITAR/IOMC guidance document, with the involvement of all concerned parties, and to use conclusions based on these assessments to define priorities to be addressed through national action programmes for strengthening chemicals management".

The United Nations Institute for Training and Research in its guidance document for "Preparing a National Profile to Assess Infrastructure and Capacity Needs for Chemicals Management" mentioned the need for "**National Profile**" for each country (UNITAR, 2012). It stated that the National Profile,

- can become an official national reference document, providing a clear picture of the national legal, institutional, administrative, and technical infrastructure for national chemicals management.
- may assist in the identification of infrastructure-related strengths, weakness, and gaps as well as priority needs for national action and external technical assistance ; and
- could provide a nationally-recognized information base against which progress may be judged in meting specific national or international targets.

It further stated that, to remain valuable, the "National Profile should be reviewed periodically" to determine when updating is needed and opined that updating process should be done appropriately every few years.

In line with above background, the Department of Environmental Protection and Conservation (DEPC) under the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Environment, Energy and Disaster Management, Government of Vanuatu has initiated the profiling of chemicals in the country.

1.4 Scope of the Consultancy

This consultancy report is a part of the development of **Vanuatu's National Chemicals Profile** which is one of the different components of the Main project "**Strengthening the National Institutional Capacity for Chemicals and Waste Management in Vanuatu**". The objective of the project is to support country-driven institutional strengthening at the national level, in the context of an integrated approach to address the financing of the sound management of chemicals and wastes, taking into account the national development strategies, plans and priorities of Vanuatu, to increase sustainable public institutional capacity for the sound management of chemical and wastes throughout their life cycle. Institutional strengthening under the Special Programme will facilitate and enable

the complete implementation of the Basel, Rotterdam and Stockholm conventions, the Minamata Convention and the Strategic Approach of International Chemicals Management (SAICM).

The development of a **National Chemical Profile for Vanuatu** through a comprehensive situational analysis is expected to provide a comprehensive overview and assessment of the existing legal, institutional, administrative and technical infrastructure related to sound life-cycle management of chemicals in Vanuatu. The data and information collected is expected to support the establishment of a solid baseline and identify national chemicals management priorities to be addressed to support implementation of the conventions that Vanuatu is party to.

The scope of the Consultant for National Chemical Profile include:

1. Conduct assessments for the existing legal, institutional, administrative and technical infrastructure related to the sound life-cycle management of chemicals in Vanuatu.
2. Identify national chemicals management priorities to support implementation of conventions which include; recommendations for legislative and institutional and technical infrastructure, data collection, chemicals emergency preparedness, public awareness of chemicals safety issues, resources available and required for sound chemicals management and training and capacity development to implement the conventions.
3. Draft the National Chemical Profile
4. Consult with stakeholders on the draft National Chemical Profile and
5. Finalize the National Chemical Profile

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Chapter 2

Vanuatu National Profile

Vanuatu National Profile

This chapter provides a brief background information on the Republic of Vanuatu, outlining the geographic context, the colonial background, and the main economic sectors of the country, in particular the industrial and agriculture industries.

2.1 Geographical Context

2.1.1 Location and Terrain

Located in the Southwest Pacific, the Republic of Vanuatu comprises eighty-three islands (Figure 2.1) spread over 1,100km from North to South with a land mass of 14,760 km^2 (Kelley, 2008). Vanuatu, formally known as the New Hebrides is located about 500 miles (800 km) west of Fiji, 1,100 miles (1,770 km) east of Australia and at 16o S and 167° E between the Solomon and New Caledonia Island chain, and is part of the Melanesian group (Galipaud, 2003). As a result of being located in the Pacific ring of fire (PROF), most islands in Vanuatu are composed mainly of volcanic material and composition, therefore being classified as volcanic islands. Vanuatu consists of six provinces, namely; Torba, Sanma, Penama, Malampa, Shefa and Tafea. The terrains of the chain of islands in Vanuatu are mostly mountainous archipelago of volcanic origin with narrow coastal plains. Located in Santo Island in Sanma province is Mt Tabwemasana, it is not only the highest peak in Vanuatu but one of the highest mountains in the Pacific with a height of 1,879 meters. Because of the presence of volcanoes and the tropical climate Vanuatu has, it produces some of the fertile volcanic soil rich in nutrients, including nitrates and phosphates that produce some of the best roots crops and livestock in the Pacific.

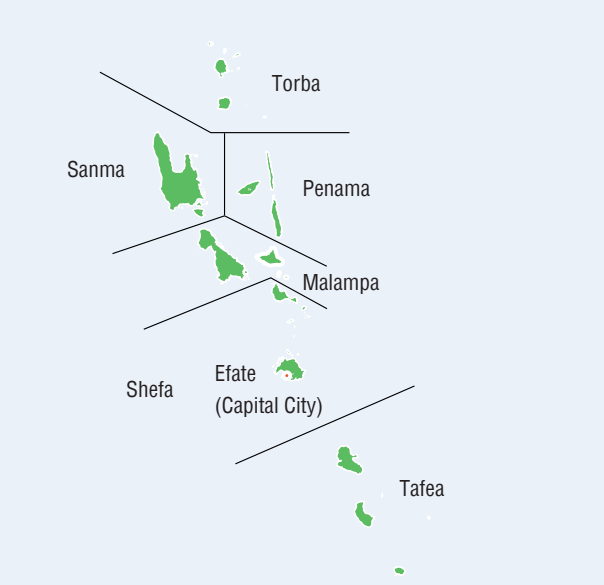

Figure 2.1 Map of Vanuatu

2.1.2 History

Before gaining its independence, Vanuatu was historically known as the New Hebrides (named by Captain James Cook in 1774) and was previously ruled by a joint government by the British and France. The two governments established an Anglo-French Condominium which lasted from 1906 to 1980 (Yoo, 2013). During that time Ni-Vanuatu (the term for the indigenous people of Vanuatu) had the option to choose which groups to subscribe under and abide accordingly to their policies and, in return, its benefits. The Anglo-French joint government came to an end on the 30th of July 1980 the New Hebrides gained its independence and became the Republic of Vanuatu. Independence was not handed down easily by the Anglo-French government but was achieved through protracted, complicated, ultimately violent struggle of Ni-Vanuatu (Jolly, 1992). Since 1980, Vanuatu has formed its own government and has been growing as an independent country.

2.1.3 Climate

Vanuatu is located in the tropics and therefore experiences tropical climate with about nine months of warm to hot rainy weather which results in a high possibility of low pressure systems (Tropical cyclones) and three to four months of cooler, drier weather characterized by winds from the southeast. The average cold temperature ranges from 22°C during the months of June and July to the hot periods of 27°C that normally lasts till the end of the year to the start of a new year (November to January). Vanuatu has a long rainy season, with a significant amount of rain expected every month. Rainfall averages about 2,360 millimeters (93 in) per year but can be as high as 4,000 millimeters (160 in) in the Northern Province.

2.1.4 Natural hazards

Vanuatu is one of the main tourist's destinations in the Pacific. The rich fertile soil, beautiful beaches and fascinating landscapes are some features that attract tourists. However, tourists must take note of the risks Vanuatu poses. As a result of Vanuatu being positioned in the PROF (plate tectonics and the ring of fire) and the tropics, it includes the country within the range of tropical cyclones, earthquakes, tsunamis, heavy rainfall and volcanoes. In addition, underlying extreme natural features such as El Niño and La Niña, storm surges, landslides and overflowing of rivers have a high possibility of occurring in Vanuatu.

Volcanoes: Vanuatu has a total of 14 volcanoes located in all six provinces, however, only six of them are active. Out of the six, Mt Yasur located in the Island of Tanna is the most active and has remained active for a long time. Mt Yasur remains under threat level 2 and is one of the main tourist's attractions in Vanuatu.

Tropical cyclones: Tropical cyclones are common in Vanuatu and occur nearly every year. Recent cyclone encounters that will never be forgotten in Vanuatu history was during 2015 and 2020 when cyclones Pam and Harold hit Vanuatu. Both cyclone Pam and Harold were category five cyclones that massively damaged Vanuatu. Houses and trees were uprooted, telecommunication lines were damaged and non-functional for more than a week, some ships were thrown onto the land.

2.2 Demographic Profile

2.2.1 Population

After Tropical Cyclone Pam, a mini census was conducted in Vanuatu in 2016 and following are various statistics from Vanuatu National Statistics Office (VNSO, 2016). The male and female ratios along with age distribution are shown in Table 2.1 and Fig. 2.2 and Fig. 2.3.

Table 2.1 Provincial Male and Female Population of Vanuatu, 2016

Indicators	Vanuatu	Urban	Rural	Torba	Sanma	Penama	Malampa	Shefa	Tafea
Males	138,265	24,506	103,759	5,153	27,901	16,549	20,689	49,541	18,432
Female	134,194	33,243	100,951	5,008	26,283	15,985	20,239	48,061	18,618
Total Population	272,459	67,749	204,710	10,161	54,184	32,534	40,928	97,602	37,050

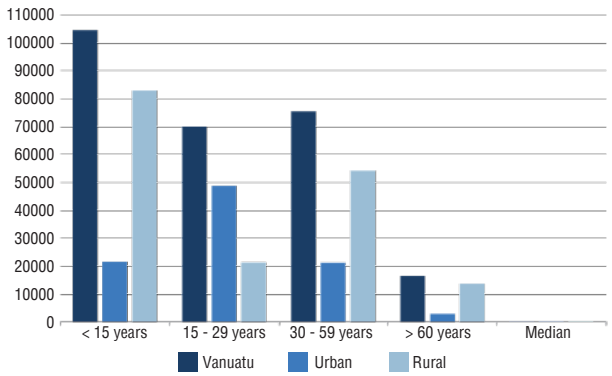

Fig. 2.2 Age Distribution of Population in Vanuatu (No. of persons)

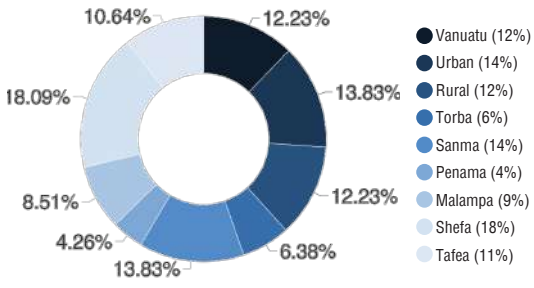

Fig. 2.3 Population Average Annual Growth Rate (%)

2.2.2 Language and Religion

Vanuatu has three official languages- English, French and Bislama (pidgin). Because of Vanuatu's past colonial rulers (Anglo-French condominium) that had a direct influence on the language and religion, Vanuatu is the only country in the Pacific that is bilingual. Bislama is the most common language spoken all through Vanuatu. It is a form of Pidgin English that began as a simple phonetic form of English which later incorporated French colloquialisms. It began to evolve and incorporate new words with its arrival in Vanuatu

by sea cucumber traders, missionaries and teachers using it as a basis to teach Ni-Vans how to speak English. Like English and French being main languages used globally for communication, Bislama is used in Vanuatu as the main basis of communication throughout all the islands and communities. On the other hand, Vanuatu has the highest language density per capital in the world, with approximately 110 different languages and 2,000 speakers of each local language. With the high migration rate of Ni-Vans from the islands to Port Vila (Capital), some languages are endangered with speakers reducing rapidly.

Vanuatu is regarded as a Christian country and consists of a number of denominations which include Presbyterian, Seventh Day Adventists, Catholic, Christ church, Mormon, Pentecostal and Assemblies of God (AOG) (Luteru & Teasdale, 1993). These denominations are found in all six provinces of Vanuatu and are all growing rapidly. Guided by Christian principals, the pioneers of Vanuatu independence established a motto stating "Long God Yumi Stanap" translating to "In God We Trust" (Eriksen, 2009). Approximately 83% of the population of Vanuatu is Christian. An estimated 32% is Presbyterian, 13% Roman Catholic, 13% Anglican, and 11% Seventh-day Adventist. Groups that together constitute 14% include the Church of Christ 3.8%, United Pentecostal Church UPCIV Assemblies of God, and other Christian denominations (IRFR, 2007).

2.2.3 Educational Status

After independence in 1980, Vanuatu's Constitution declared that English, French and Bislama are official languages, Bislama is the national language, and English and French are the principal languages of education (Early, 1999). Primary education is available to almost all the children in Vanuatu except a few remote tribal areas. This availability of primary education is made possible through the government plan to pay for all primary level students' tuition fees. However, this does not include secondary schools. There are currently 876 early child care education, 482 primary and 114 secondary schools in the country (MoET, 2020). The University of the South Pacific established its Emalus Campus in Port Vila around thirty years ago and offering various graduate and post graduate courses, which are mostly in social sciences. The newly established Vanuatu National University started to offer some courses since 2020. The overall literacy rate of 2018 is 87.51 with an increase of 2.81% from 2014 (Macrotrends). The main concern for the educational system in the country is the shortage in qualified teachers and also the non-willingness to work in some of the remote islands by teachers. The school enrolments for 2018-2020 are shown in Fig. 1.4 and literacy rate for 2018 is shown in Fig. 1.5.

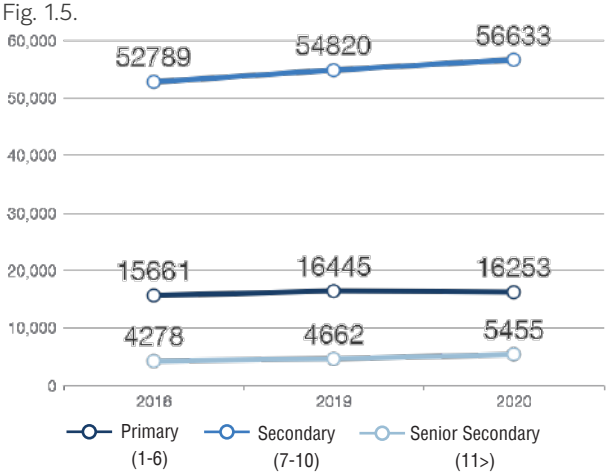

Fig. 2.4 School Enrolments for 2018-2020 (No. of students)

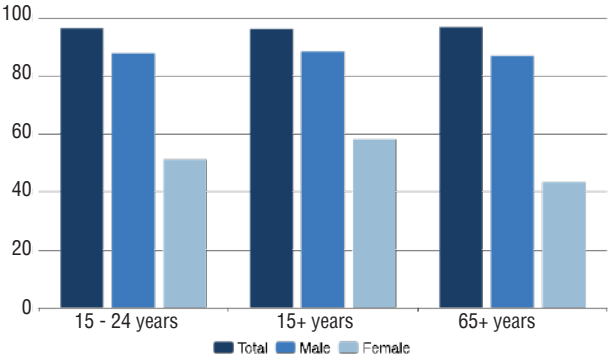

Fig. 2.5 Literacy Rate Percentages of 2018 (source: UNESCO)

2.2.4 Industrial sectors

Vanuatu's economy in the past decade has expanded showing positive growth for the country. The economy grew by 2.9% in 2018. However performances also slowed down the same year due to the huge decline in services and agriculture while industry has dropped but not too significant compared to services and agriculture (VNSO, 2020). Agriculture, fishing and forestry have continued to grow in the country. The subcomponents of agriculture that influence this positive growth are crop production, animal or livestock production, fishing and forestry. Crop production forms a dominant 80% share of the total output in agriculture, therefore if crop production reduces (weak performance), it will result in a slow growth rate in

the overall agriculture sector. The main economic crops in Vanuatu are copra, cocoa and Kava. With the increasing rate of production each year, agriculture, fishing and forestry production are still threatened by the high predicted rate of natural hazards the country experiences.

Industries continue to improve in Vanuatu with 'construction' being the main driver and it recently continues to grow following the post-Tropical Cyclone Pam reconstruction and ongoing infrastructure projects located in the capital and also in some outer islands. These infrastructural developments depend on aid and revenue that is gained mostly by tourism. In 2017, Vanuatu opened one of its biggest wharfs and currently the government is expanding the airstrip run way with more hotels, shops and roads expected to increase in the country.

The Vanuatu economy has enjoyed growth in the last five years on the back of tourism, Real Estate and Public Infrastructure Expenditures funded by donor partners. The services industry continues to expand with the growing population. The sub-components that positively influenced the overall services is finance and insurance, followed by information and communication, food and accommodation services, real-estate, whole-sale and retail trade, public administration, health and education. The economic growth of Vanuatu is mainly driven by the service sector. The Services sector is dominant in terms of value-added but its growth has been very unstable and in terms of labor it involves only 30% of the population; the 60% of Vanuatu population still use agriculture as a means for survival. The imports and exports for 2018-2020 are shown in Fig. 1.6 and GDP for 2018 in Fig. 1.7. The share of GDP for domestic products of 2019 is shown in Fig. 1.8 and share of main import commodities for 2019 is shown in Fig. 1.9.

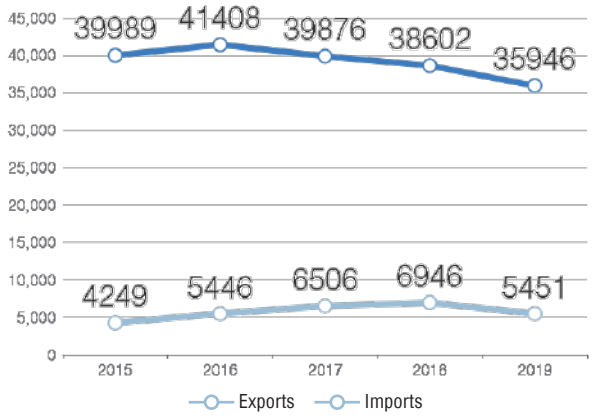

Fig. 2.6 Exports and Imports (Million Vatu)

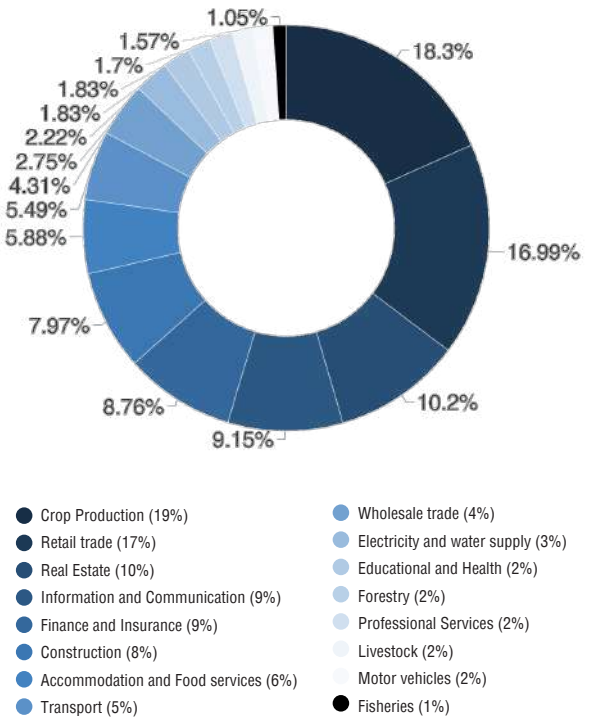

Fig. 2.7 GDP Contributions 2018

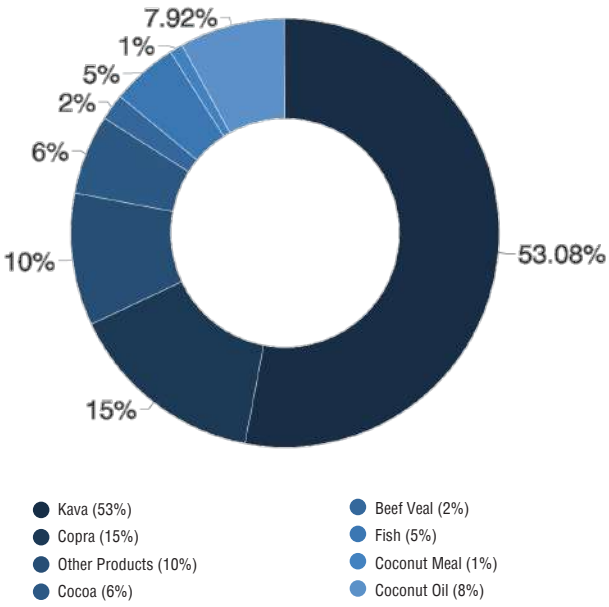

Fig. 2.8 Share of Main Domestic Products Total Value, 2019

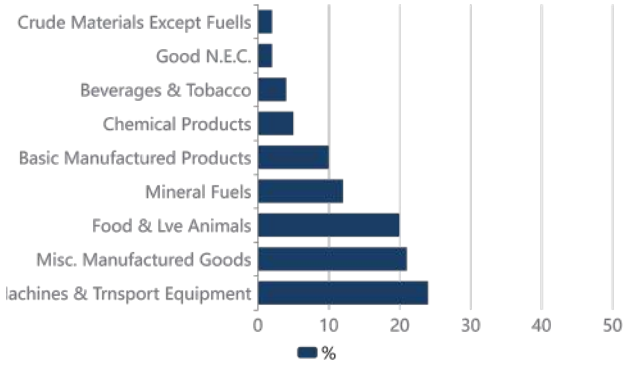

Fig. 2.9 Share of main import commodities total value, 2019

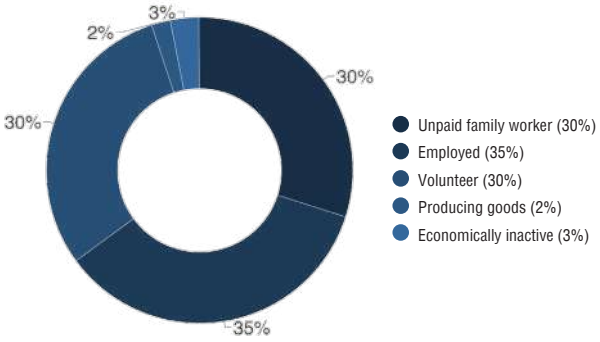

Fig. 2.10 Economic activity of population during last 7 days of 2016 census

2.2.5 Employment Status

It is difficult to measure true employment or unemployment in Vanuatu due to the fact that many people who might be unemployed do not look for jobs as they may not be any jobs available or they may not have the qualifications to obtain one. Vanuatu economy is based on the primary sectors of agriculture, forestry and fishing, which provide a living for the majority of Vanuatu's population and employment statistics of these are often complex. But according to the 2016 census which considered last seven days activity during their survey recorded the following economic activity in the country (Fig 2.10).

2.3 Political Structure

Vanuatu is a multiparty parliamentary democracy with a freely elected government that is guided by the constitution of the Republic of Vanuatu. The president is head of the state. The Prime Minister has executive power of the government. The parliament consists of 52 Member of Parliament being elected for very four years term of office. Apart from the Prime Minister's supervision of some departments, there are twelve State Ministers who oversee the functioning of various ministries and departments. The local governance is divided into six administrative divisions located in each of the six provinces.

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Chapter 3

Chemical Product Imports of Vanuatu

Chemical Product Imports of Vanuatu

This chapter comprises the various chemical products that are being imported by Vanuatu. The data include the import of three years (2018/19/20). Details of the chemical compounds, weight, cost, country of import and origin are discussed in detail. The impact classification of the chemical compounds is also presented.

3.1 Data Collection

3.1.1 Stakeholder Meetings

The Department of Environmental Protection and Conservation organized National Chemicals Coordination Committee (NCCC) meeting to introduce the appointment of the Consultant for National Chemical Profiling (Fig. 3.1). The committee was composed of representatives from various Government Departments like, Agriculture, Biosecurity, Chamber of Commerce, Customs and Inland Revenue, Education, Foreign Affairs, Forestry, Geology and Mines, Local Authority, Meteorology and Geo-hazards, Ports and Harbor, Public Health and Water Resources. The committee also comprised of business and academic institution representatives. Stakeholder meetings were also organized in two provincial centers (Luganville, Santo and Lenakel, Tanna) (Fig. 3.2 and Fig. 3.3). DEPC requested the support of all stakeholders in facilitating necessary arrangements for the consultant to procure relevant data in preparation of the National Profile. Apart from these, the consultant visited various other stakeholders for the collection data.

Fig. 3.1 National Chemicals Coordination Committee (NCCC) meeting in Port Vila

Fig. 3.2 Stakeholders meeting in Luganville

Fig. 3.3 Stakeholders meeting in Lenakel

3.1.2 Harmonized System Data

Data collection was mainly facilitated by Vanuatu's Customs and Inland Revenue Department. The department's Harmonized System (HS) records all imports into the country. The HS is governed by "The International Convention on the Harmonized Commodity Description and Coding System", which was adopted in June, 1983 and entered into force from January, 1988. The Convention is maintained by the World Customs Organization (WCO) (formerly the Customs

Co-operation Council), an independent intergovernmental organization based in Brussels, Belgium, with over 200 member countries (Wikipedia). All the items under the code have 6 digits, where the first two digits indicate the HS Chapter, the next two digits indicate the HS heading and the final two digits specify the HS subheading. HS code system was amended six times till date. Vanuatu became a member of the WCO in 2009. Vanuatu acceded to the International Convention on the Harmonized Commodity Description and Coding System on 28th March, 2018. Vanuatu's HS2017 consists of 5,518 codes along with local splits as well.

Nationally, the process involved in updating the HS document is consultations with government agencies and stakeholders on their legislations and national policies that Customs can work in collaboration with these agencies by implementing at the border and also aligning those changes with World Customs, WTO and other international and regional organisations (agreements) that Vanuatu is a part of. The Seventh Edition, HS2022 version is currently in its final stages of completion awaiting parliamentary approval to be effective from 1st January, 2022.

In the current evaluation of imports data of 2018, 2019 and 2020 was accessed. The chapters and their contents were considered in this data evaluation were shown in Table 3.1. Customs notes the imports under specific "HS Code" followed by "HS Description" and further with, "Importers Goods Description". At times under the HS Description, customs notes the imports as "Others" to indicate not specific of the sub-code but related based on the importers details. The HS system consists various provisions where by-products of some category are part of other chapters as well and at times it very difficult to clearly identify the chemical contribution from various products. In many cases it can be presumed that raw materials being imported are used to prepare various products which come under another chapter thus both differ in their chapters.

Some chapters extensively cover many products and "it was difficult to find the chemical combination of the import" and, in particular, under the description of "Other". Following are some of many such examples.

HS Code	HS Description	Importers Goods Descrip-tion
34011900	Other	BLU PASTE DET
34011900	Other	SAVON 100G
30049000	Other	MEDICINE
30049000	Other	DRUG
28043000	Other	JAVEL

There are cases where under a given Chapter, both the HS and importers descriptions are given as "Others".

Examples:

HS Code	HS Description	Importers Goods Description
38247900	Other	Other
30059000	Other	Other
28271000	Other	Other
30049000	Other	DRUG

Cases where both HS and importer's descriptions were the same. The issue here is that these are entries with tens of kilograms but no specificity of the contents. Examples:

HS Code	HS Description	Importers Goods Description
38089100	Insecticides	Insecticides
38089400	Disinfectants	Disinfectants
38089200	Fungicides	Fungicides

Cases were also found where the "same importers description has different HS description". Examples:

HS Code	HS Description	Importers Goods Description
38089100	Insecticides	Mosquito coils
38086900	Other	Mosquito coils
27111300	Lubricating oil	Engine oil
27101211	Other	Engine oil
27101220	Lamp Kero-sene	Kerosene
27101290	Other	Kerosene 1L

Cases were noted where HS code and importer description entry were done vice-versa. Examples,

HS Code	HS Description	Importers Goods Description
28470000	Sodium	Sodium bicarbonate
28111100	Sodium bicarbonate	Sodium

There are entries found where same HS and importer description but a different HS code. Examples,

HS Code	HS Description	Importers Goods Description
28011000	Chlorine	Chlorine
28332700	Chlorine	Chlorine
28259000	Chlorine	Chlorine

Entries were identified where same HS code was used for different HS description. Examples,

HS Code	HS Description	Importers Goods Description
28011000	Chlorine	Chlorine
28011000	Carbon dioxide	Carbon dioxide
28011000	Iodine	Obetterical
28011000	Other	Other barium nitrade
28011000	Other	Sodium hypochlorite
28011000	Other	Acetone

Cases of entries were also found where the entry/ classification is hard to tag under appropriate product. Examples,

HS Code	HS Description	Importers Goods Description
38089200	Fungicides	MOSQUITO NET
38249900	Other	FLUID
28391900	Other	CIP

Some anomalies were reported to Customs Department and it was assured that they had taken note of these and will work on mitigating errors in future entries. It was also informed that there are several issues related to these kinds of entries and some of them include issues like wrong information from brokers, staff change etc.

Table 3.1 HS Chapters and Contents

Chapter	Contents
24	Tobacco and manufactured tobacco substitutes
25	Salt; sulphur; earths and stone; plastering materials, lime and cement
26	Ores, slag and ash
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; min-eral waxes
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare earth metals, of radioactive elements or of isotopes
29	Organic chemicals
30	Pharmaceutical products
31	Fertilizers
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other col-ouring matter; paints and varnishes; putty and other mastics; inks
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles & similar articles, modelling pastes, “dental waxes” & dental preparations with a basis of plaster
35	Albuminoidal substances; modified starches; glues; enzymes
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations
37	Photographic or cinematographic goods
38	Miscellaneous chemical products
39	Plastics and articles thereof
40	Rubber and articles thereof
68	Articles of stone, plaster, cement, asbestos, mica or similar materials
72	Iron and steel
73	Articles of iron or steel
74	Copper and articles thereof
75	Aluminum and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof

3.1.3 Stakeholder Data

Data from various stakeholders was also obtained as part of the assessment of various chemicals that are being imported into the country. This was the hardest part of the whole consultancy work. Multiple reminders/visits were needed to have the data to be supplied. In many cases stakeholders did not supply the data, even after several requests, and responded with the fact that they are not maintaining any stock registers. Some people blamed staff changes and misplaced files as reasons for not supplying the required data. Except in some instances, most of these organisations use very little quantities as their annual consumption. It is noticed that there is lack of chemical data management in most of the businesses, public and private companies/organizations. The data supplied by some of the stakeholders is correlated with HS data during the assessments.

3.2 Chemical Data Assessment

As it is evident from the HS data supplied that there are multiple anomalies in the entry alongside with non-supply of data from many stakeholders, there needed a holistic approach to minimise these gaps and assess the available data to present a report that would represent the best fit model with given circumstances. To achieve this impeccable task with multiple constrains in data, the following general rules were applied during the current available data analysis (Fig. 3.4).

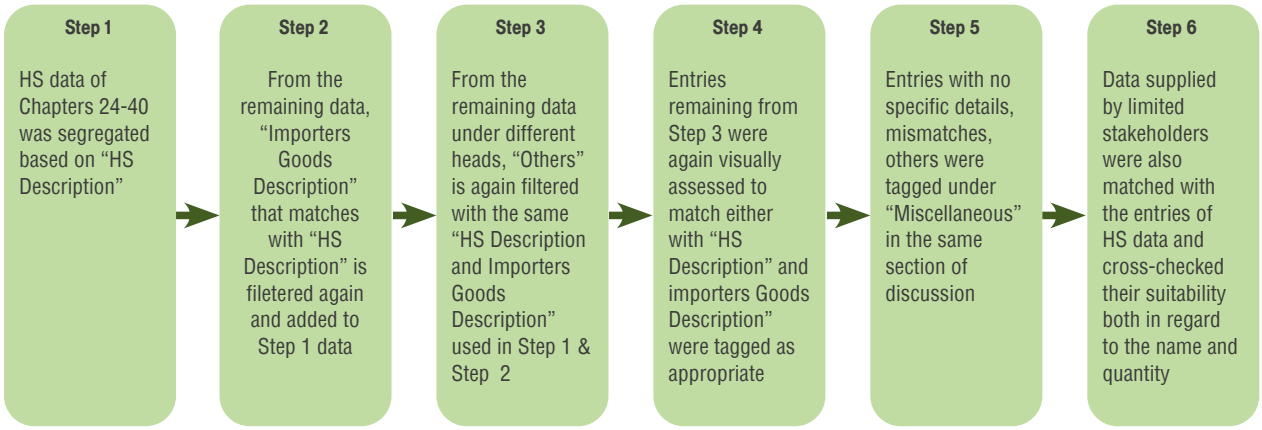

Fig. 3.4 Flow chart of data analysis

Once this exercise was completed to have the chemical data separated under different headings, the annual import and costs were calculated. This was replicated for years 2018, 2019 and 2020. A comparative three year trend along with three year average was calculated and graphs were plotted accordingly. A brief note of the chemical composition is noted for each section of these chemical compounds. An overall view of country of import and origin was also made in general.

3.2.1 Reporting units of Imports

The analysis and reporting of multiple products with different measuring units is always considered to have a non-uniform representation. Added, it was observed that same product was noted in different units and thus it was impractical to track the units precisely. As products of solids, liquids and gases do vary in their measuring and supply units, the present analysis tried to represent the most uniform way with specific units where possible for those products which differ from the set of representation in a given graph.

Following data analysis mentioned in section 3.2 various chemical/products imports are analysed and summarized below for the triennium period. While taking the total value, decimal figure less than 5 is not considered and in case of above is rounded to the left digit by one. The data represented will be in the following units: KGM – Kilogram

per cubic meter, MTQ – Cubic meter, LTR – Litre and NMB – Number. It is to be noted in case of "Miscellaneous (Misc. Chemicals)", as they comprise various products with varied units, the representation in any graph should be taken as this combination.

3.3 Chemical Imports Statistics 2018-2020

Vanuatu National Statistics Office annually releases their overall imports and exports data with some comparative statements with previous year data. The 2018-2020 import data is presented below in Fig. 3.5. The average chemicals and allied products and mineral products imports for the period of 2018-2020 is 2,031 and 9,164 Million Vatu respectively. It is interesting to note almost same annual trend for chemicals and allied products import over the triennium period but conversely the imports of mineral products decreased in 2020. The impact of Covid-19 pandemic might be a strong reason in this decrease and again interesting to note the non-impact of the same on chemical and allied products imports. These annual imports indicate there is a high usage of chemical products in Vanuatu. When the annual chemical contributions from other goods of import are also considered along with above two, it would further indicate that there is substantial usage.

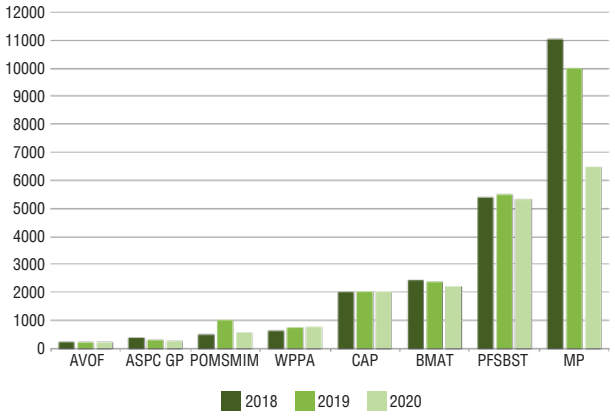

Fig. 3.5 Annual imports of various goods, 2018-2020 (Million Vatu)

AVOF	Animal/Vegetable oils & fats
ASPCGP	Articles of stone, plaster, cement, glass & ceramic products
POMSMI	Photographic & optical, medical & surgical & clocks & music instruments
WPPA	Wood pulp & paper & paperboard & articles
CAP	Chemicals & allied products
BMAT	Base metals & articles thereof
PFSBST	Prepared food stuffs, beverages, spirits & tobacco
MP	Mineral products

3.3.1 Inorganic Compounds

The imports of inorganic compounds for 2018-2020 are shown in Fig. 3.6. The other compound that is not included in the list is Sodium chloride which is commonly used as table salt. Its imports for the triennium period are 1,100.9, 1096.4 and 911.9 tonnes respectively. The miscellaneous chemicals include quantities which have very less annual imports or no imports in a particular year. This category also includes where there is specific description was not being entered but only referred as "chemicals" or "others". They include various compounds of Aluminium, Ammonium, Magnesium, Calcium, and Copper. In 2018, 2,628 KGM of Potassium sulphate was imported, where no entries were observed for remaining two years. In 2019, 22,000 KGM of Ammonium nitrate was imported in 2019 and no entries were recorded for the other two years. This includes compounds like Iodine, Boric acid, Hydrogen peroxide, Silver nitrate, battery water. A list of some of these imports is provided in Table 3.2.

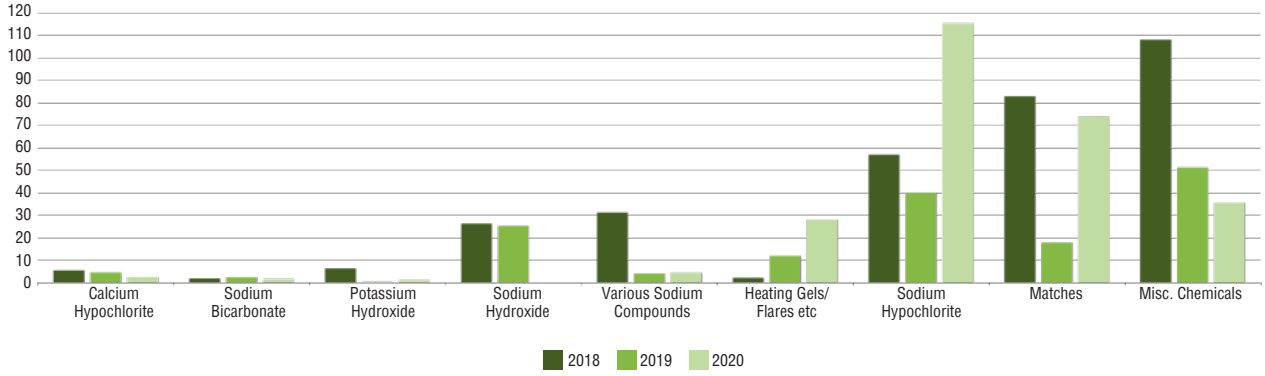

Fig. 3.6 Major inorganic chemicals imports of 2018-2020 (Tonnes)

Table 3.2 Minor inorganic compounds imports of 2018-2020

Compound (KGM)	2018	2019	2020
Magnesium chloride	12.0	7.3	9.1
Magnesium sulphate	2.0	0.0	0.0
Calcium carbonate	213.4	0	0.0
Calcium chloride	0.0	198.0	343.7
Calcium carbide	0.0	0.0	23,850.0
Calcium oxide	0.0	0.7	0.0
Aluminium sulphate	0.1	857.9	1,368.0
Boric acid	1,045.0	0.0	258.0
Iodine/Iodides	14.2	5.2	177.9
Hydrogen peroxide	311.9	353.1	168.3
Silver nitrate	2.0	5.5	0.0
Barium compounds	3.8	1.0	0.0
Zinc compounds	251.1	6.0	95.4
Potassium permanganate	118.8	2.0	1.0
Titanium oxide	10.8	0.6	81.0

3.3.2 Organic Compounds

The major imports of organic compounds for 2018-2020 are shown in Fig. 3.7. There are certain in the "Miscellaneous" section where compounds are imported in high quantity in a particular year but no record in other years. These imports in KGM include cases like, Dodecylbenzene, 1,025 (2018), Toluene, 2,084 (2018), Dichloromethane, 3,570 (2018), Tetraehtylammonium perfluorooctane sulphonate, 2,630 (2020), Organic surfactant, 1,043 (2019), Organic surface-active (body wash preparations), 2,086.4 (2018), Organic peroxide, 590 (2020). The other compounds/groups of small imports include esters, ethers, alcohols, lactones, acids, aniline derivatives, benzaldehyde, benzalkonium chloride, sodium benzoate etc. The miscellaneous organic compounds also include compounds which are imported in a particular year or in very small quantities and notable among these are given in Table 3.3.

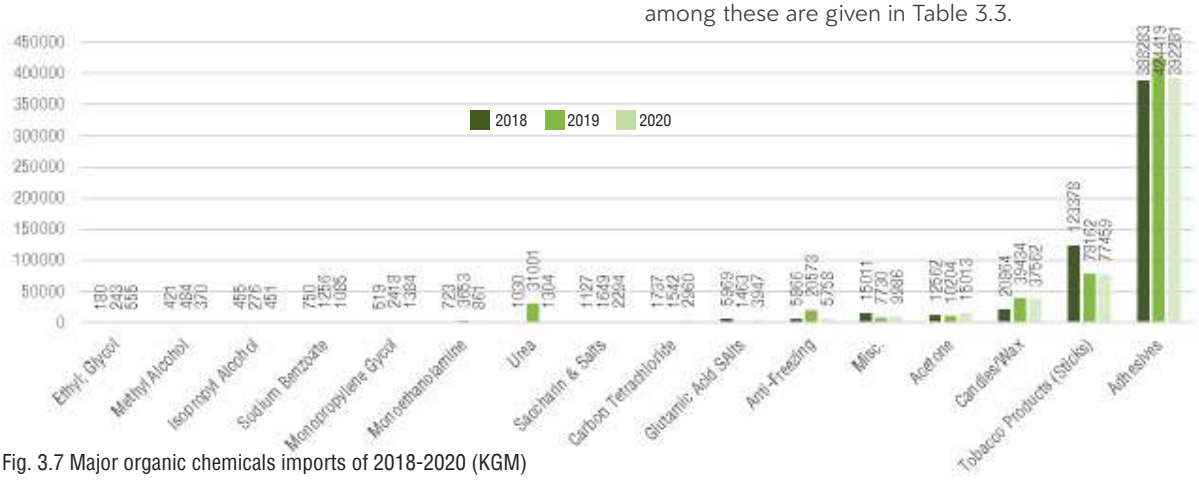

Fig. 3.7 Major organic chemicals imports of 2018-2020 (KGM)

Table 3.3 Minor organic compounds imports of 2018-2020

Compound (KGM)	2018	2019	2020
Trimethylolpropane	250	0	202
Dimethlyaniline	22.5	0.0	0.0
Morphine	15.0	154.0	6.0
Glycerol	0.0	101.1	36.4
Lactic acid and its salts	4.1	360.0	1,002.2
Nonylphenol	0.0	200.0	283.0

Various organic and inorganic acids imports for 2018-2020 are shown in Fig. 3.8 and gas imports are shown in Fig. 3.9.

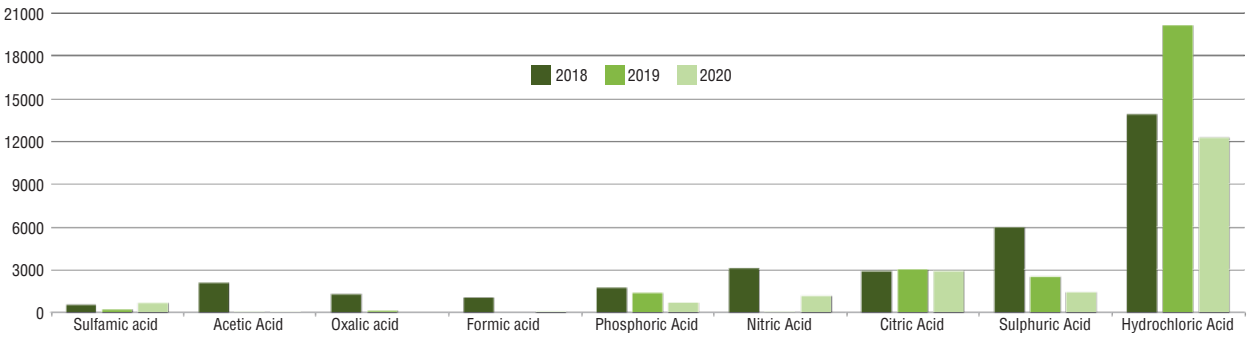

Fig. 3.8 Organic and Inorganic acids imports of 2018-2020 (KGM)

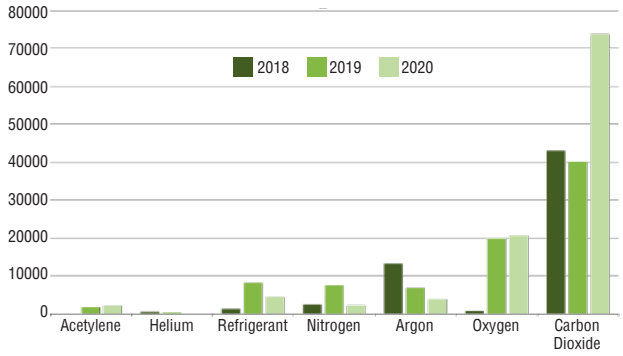

Fig. 3.9 Gas imports of 2018-2020 (MTQ/KGM)

The chemical usage of a major distillery company is shown in Table 3.4 and is as follows.

Table 3.4: Chemical consumption of a major distillery company 2018-2020

Compound (KG/Lit)	2018	2019	2020
Sulphuric acid	971	709	50
Ecolab Octave	358	283	156
AC 300 E Cleaner	1051	830	421
Caustic soda	35180	27378	24033
Stabilon	4523	3520	0
Stabicip ZNX	0	0	2403
Dicolube	456	360	100
Diverspray VC13	186	147	180
Pascal VA5	100	79	100
DIVOSHEEN 209	200	215	150
Incor X	50	50	43
Propylène Glycol	1600	1400	600
Anti Foam	50	43	0
MEA	2400	2511	0
Potasssium permanganate	39	40	0
Soda ash	44	39	55
Oxalix Acid Powder	25	25	25
Alpha P scale	0	0	38

3.3.3 Hydrocarbon Products

The major hydrocarbon products imports for 2018-2020 are shown in Fig. 3.10. These generally include the petroleum products in form of various oils. “Miscellaneous” section includes various engine oils, peat, cleaning solutions etc.

3.3.4 Agricultural Support Products

The major agricultural support products imports for 2018-2020 are shown in Fig. 3.11. These generally include various insecticides, herbicides, insecticides, fertilizers. It is to be noted that “Disinfectants” that comes under HS32 is shown in “Cosmetics and soap products” section. The imports of “Anti-freezing” shown in “Major organic imports” also belong to HS32. It is interesting to note that among the miscellaneous, “Correction Fluid/Pen” is being imported in high quantities. The annual imports in KGM for 2018, 19 and 20 are 2,994, 2,726 and 2,608.

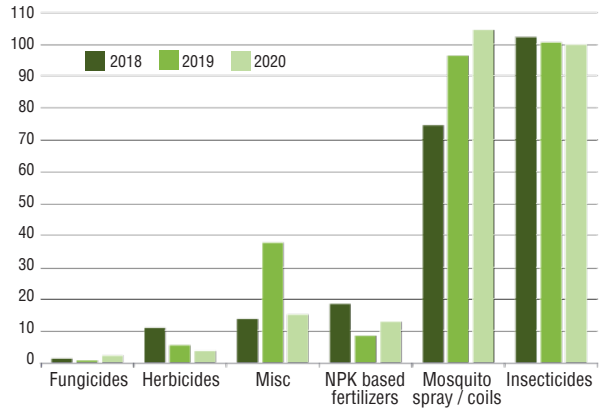

Fig. 3.11 Agriculture support products import of 2018-2020 (Tonnes)

Three-year data-sets of sales were provided by one of the major agricultural business company. This enabled the identification of specific names of the various chemicals being used in this sector. Eliminating the small quantity sales,

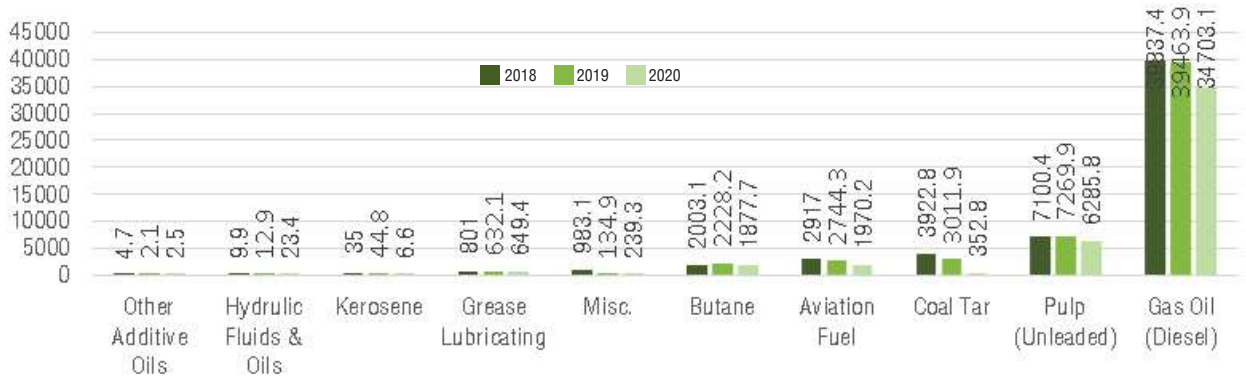

Fig.3.10 Hydrocarbon based products import of 2018-2020 (Tonnes)

(Dichlorophnoxyacetic acid) common selective herbicide, Glyphosate (N-(phosphonomethyl)glycine) used as common herbicide and crop desiccant, Metsulfuron (2-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)carbamoylsulfamoyl]benzoic acid) used as selective herbicide, Paraquat (1, 1′-dimethyl-4,4′-bipyridinium dichloride) used as a common and selective herbicide or weed killer, Picloram (4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid) is used for general woody plant control, K-ethephon ((2-Chloroehtly) phosponic acid) is generally used as a plant regulator and also in promotion of fruit ripening. DSMA (Disodium methylarsonate) is a commonly used herbicide that acts as selective weed killer.

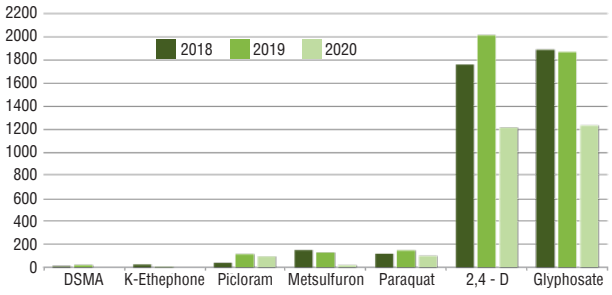

Fig. 3.12 Chemical sales of a major agricultural supplier for 2018-2020 (Kg/Lit)

A major pest control stakeholder supplied three years of data for the various pesticides and insecticides used by their company. The data analysis is as follows and shown in Fig. 3.13. The most imported chemical pest control imported in to the country is Bifenthrine, a common pyrethoid insecticide (2-Methylbiphenyl-3-ylmethyl (Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate), with an average around333 Lits from 2018-2020. Rodent bait (general composition include, sodium fluoroacetate and alpha-naphthlythiourea) had an average of 200 Litsis commonly used to control rodents and Permethrin (3-Phenoxybenzyl (1RS)-cis, trans-3-(2,2-dichlorovinyl) -2,2-dimethylcyclopropanecarboxylate) is a commonly used insecticide and averaged 100 Lits of imports in the last three years. The three year usage by the stakeholder is shown in Fig. 3.10.

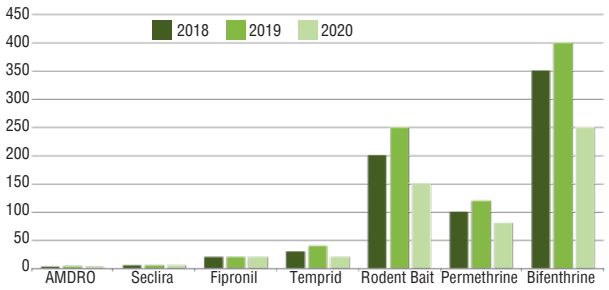

Fig. 3.13 Chemicals usage of a major pest control company for 2018-2020 (Kg/Lit)

3.3.5 Alcoholic Products

The imports of various alcoholic products for 2018-2020 are shown in Fig. 3.14. The “Miscellaneous” section includes various alcohols with different percentages of alcohols and other associated products.

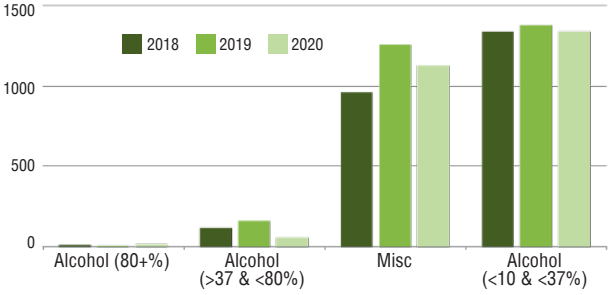

Fig. 3.14 Alcohol products import of 2018-2020 (Lit x 10^3)

3.3.6 Cosmetic Products

The imports of various cosmetic and soap based products in cosmetics for 2018-2020 is shown in Fig. 3.15. The “Miscellaneous” section include various lotions, wipes, dental cleaners, balms, tooth pastes, shaving creams etc.

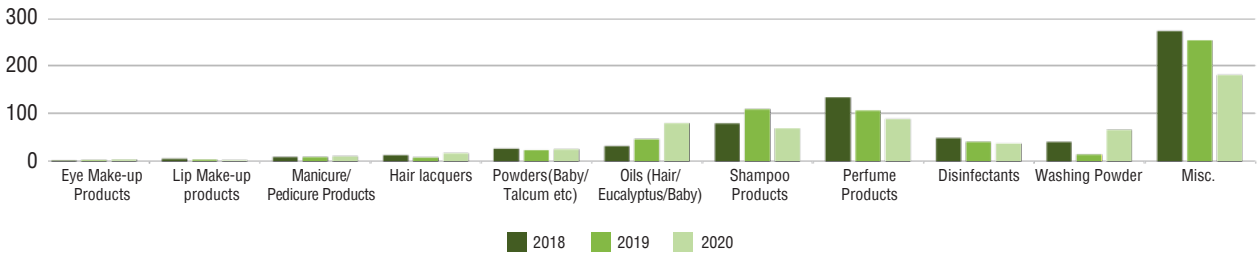

Fig. 3.15 Cosmetics and soap products import of 2018-2020 (Tonnes)

3.3.7 Pharmaceutical Products

The imports of various pharmaceutical products that include both human and veterinary usage for 2018-2020 is shown in Fig. 3.16. The "Miscellaneous" section includes various test kits, medicines, bulk medical donations etc.

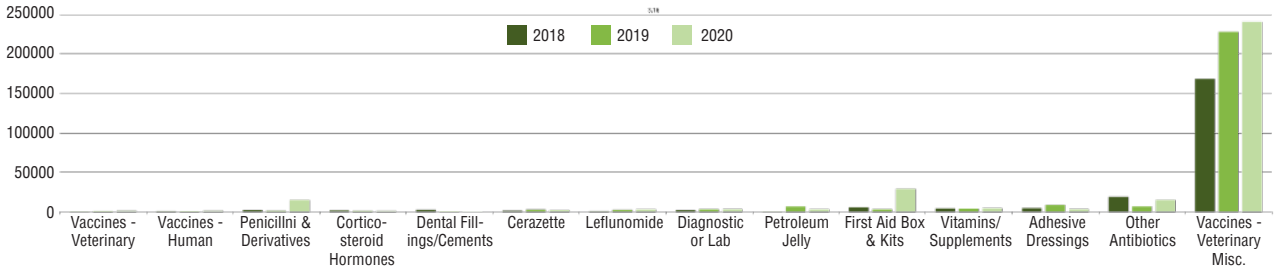

Fig. 3.16 Pharmaceutical imports of 2018-2020 (KGM)

3.3.8 Construction Products

The imports of various products used in construction and allied works for 2018-2020 is shown in Fig. 3.17. In general, these products are mixtures of multiple chemical compounds, cement mainly constitute, alumina, iron oxides, silica etc, whereas, putty / fillers /sealants generally constitute, calcium carbonate, calcium powder, white cement, talcum powder (silicate mineral of magnesium and oxygen), hydroxyl propyl methyl cellulose, kaolin clay, natural resins, barium sulphate, sodium alginate and other small amounts of chemicals based on the type of product's brand.

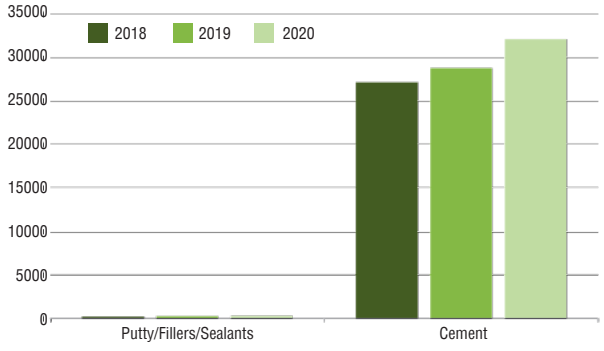

Fig. 3.17 Construction products import of 2018-2020 (Tonnes)

3.3.9 Paints and Printing Products

The paints, printing and allied imports of various products for 2018-2020 is shown in Fig. 3.18. In general these products are mixtures of multiple organic chemical compounds with little inorganic compositions as well (ex, pigments). Dyes generally constitute compounds like carboxylic/sulphnoic acids, amino and hydroxyl groups, whereas paints are made up of clays, calcium carbonate, mica, silica, talc etc. Thinners and varnishes are made of toluene, turpentine, naptha, methyl ethyl ketone, polyurethane, mineral spirit, phenolic compounds, various oils etc. Inks generally constitute oils of soybean or linseeds with combination of various distillates of petroleum based products. Epoxy resins compounds of bisphenol A diglycidly ether, commonly known as BADGE. The acrylic compounds are complex organic compounds made from various acrylates (prop-2-enoate 2-propenoate 2-propenoic acid) such as ethyl and butyl along with methacrylates like and meth and butyl methacrylates. Vinly polymers are made by the polymerized compounds of vinly monomers, which is basically ethylene molecules being the main structural unit in the polymer. The "Miscellaneous" section includes various colorants, coats, oils etc.

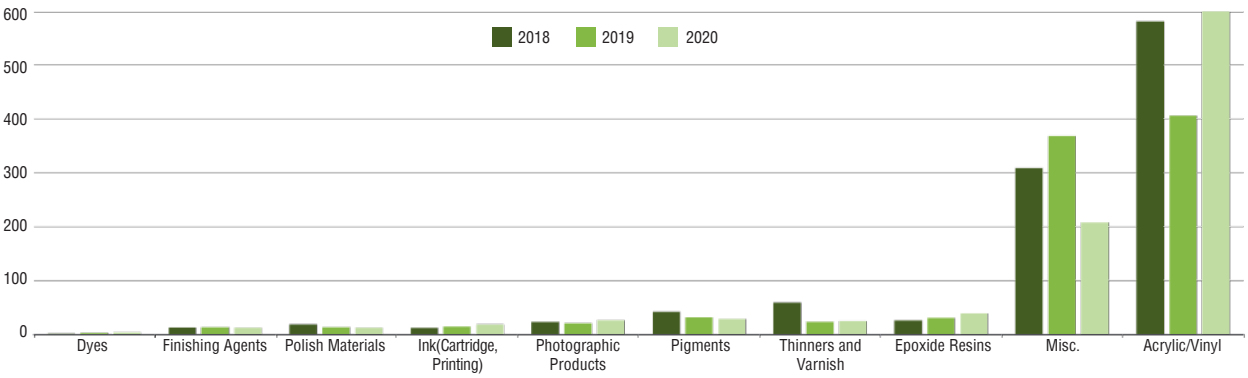

Fig. 3.18 Paints and printing products import of 2018-2020 (Tonnes)

3.3.10 Metal Products

The imports of various metal products for 2018-2020 are shown in Fig. 3.19. In general these products are predominantly mixtures of iron based compounds with various other alloys of various elemental compositions.

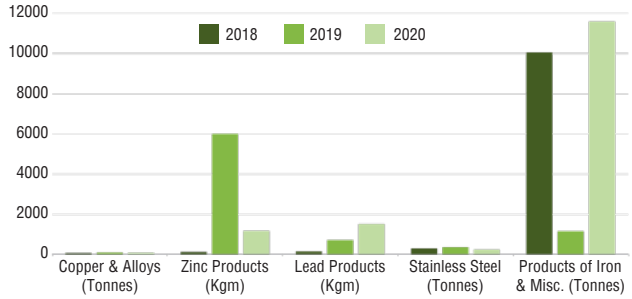

Fig. 3.19 Metal products import of 2018-2020

3.3.11 Rubber Products

The imports of various rubber products for 2018-2020 are shown in Fig. 3.20. In general these products are predominantly mixtures of multiple organic chemical compounds. Natural rubber, a polymer of isoprene (2-methylbuta-1,3-diene) and synthetic rubbers generally are Buna rubbers made of styrene-butadine and butadiene. Carbon black, Sulphur and other raw materials are also mixed as per required strength and brand.

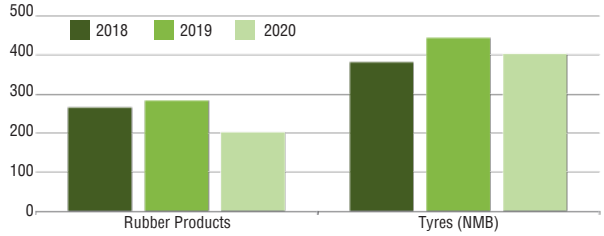

Fig. 3.20 Rubber products import of 2018-2020 (Tonnes)

3.3.12 Miscellaneous Products

The "Miscellaneous" imports of various HS chapters are shown in Fig. 3.21. They include various compounds of varied origin. HS 38 includes correction fluid, preservatives, rat/cockroach poison, lab reagents, test kits, cleaning agents, thinner, various oils, pickling materials etc. Whereas HS 25 includes various silica, quartz, and, clay products. The biodegradable products include paper take away boxes, cloth storage boxes, disposables etc. Whereas plastic products include, Polypropylene, Polyurethanes, polymers of ethylene, vinyl chloride, styrene etc.

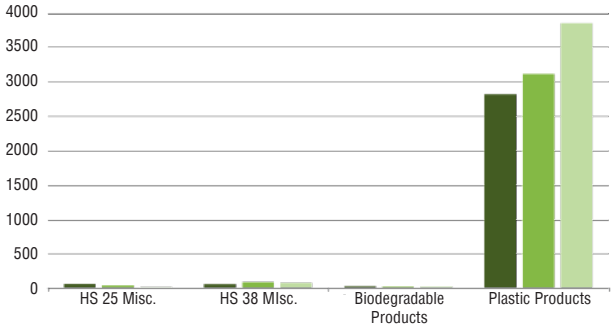

Fig. 3.21 Various miscellaneous products import of 2018-2020 (Tonnes)

3.3.13 Imports Value and Country of Origin

The value of the imports in Million Vatu is shown in Table 3.5 for the years 2018-2020. This was calculated from the HS chapter's "Statistical Value" shown against each entry. This includes all entries of goods that are imported to Vanuatu through all ports and through air freight. The value of the imports is sum of all the entries for a given year based on the entry in the HS system. The same flow of exercise for calculation was done as shown earlier in calculating the quantity of imports of individual chemical compound (Fig. 3.4). It can be noted that most of the imports are from Australia and New Zealand. Considerable imports are also products of Fiji and China. As normal, the import cost for fuels was the highest and are mainly imported from Singapore. Pharmaceutical, construction, cosmetics imports from multiple countries do also contribute to bulk imports.

Table 3.5 Chemical Compounds imports cost and country of import 2018-2020

Import Name	Import Value in Million Vatu			Country of origin*
	2018	2019	2020	
Inorganic Compounds				
Calcium hypochlorite	0.64	0.69	0.76	NC/USA/AU/FJ
Sodium bicarbonate	0.34	0.56	0.42	FJ/AU/NZ/MC
Potassium hydroxide	2.18	0.06	0.23	NZ
Sodium hydroxide	2.81	1.86	0.01	NZ/NC/HK/CN
Various Sodium compounds	5.56	0.74	0.65	AU/NZ/MC
Heating gels, flares etc	1.4	10.92	15.06	NZ/AU
Sodium hypochlorite	6.28	4.55	11.95	AU/NZ
Matches	18.63	3.3	15.84	IN/FJ/ID
Miscellaneous chemicals	11.61	6.55	5.65	MC
Sodium chloride	32.59	33.73	26.42	MC
Organic Compounds				
Ethyl glycol	0.06	0.1	0.2	AU
Methyl alcohol	0.42	0.36	0.22	AU/NZ
Isopropyl alcohol	0.2	0.25	0.11	AU/NZ
Sodium benzoate	0.47	0.27	0.32	NZ
Monopropylene glycol	0.15	0.46	0.22	AU
Monoethanolamine	0.18	0.32	0.07	AU
Urea	0.21	1.57	0.05	CN/NZ
Saccharin & salts	0.87	0.83	1.97	NZ
Carbon tetrachloride	1.48	1.15	2.19	AU/SG
Acetone	3.89	3.67	3.84	AU/NZ
Glutamic acid & salts	0.74	0.81	0.88	ID/HK/CN/VN
Anti-freezing	2.23	4.13	2.45	AU/NZ/HK/MC
Candles / wax	4.64	8.69	5.4	AU/NZ/HK/MC
Adhesives	55.74	48.89	53.14	AU/NZ/HK/MC
Miscellaneous	9.79	7.08	5.79	MC
Tobacco products	303.44	342.01	329.24	AU/ID/MC
Acids				
Sulfamic acid	0.13	0.04	0.16	NZ/NZ
Acetic acid	0.04	0.01	0.01	HK/NZ
Oxalic acid	0.13	0.04	0	A/CN
Formic acid	0.01	0	0.02	AU/HK
Phosphoric acid	0.19	0.3	0.14	AU/HK
Nitric acid	0.5	0.01	0.19	AU
Citric acid	0.21	1.06	1.25	AU/NZ
Sulphuric acid	0.59	1.31	0.2	AU/NZ/FR
Hydrochloric acid	1.88	2.93	1.15	AU/NZ/FR

Gases				
Acetylene	0	0	0.41	CN/NC/FJ
Helium	0.24	0.34	0	SG/FJ/AU
Refrigerant	1.46	3.78	0.74	FJ/CN/SG/NZ
Nitrogen	0.62	0.96	0.5	FJ/CN
Argon	3.19	2.09	1.11	FJ/AU/NZ/FR
Oxygen	0.28	0.93	1.57	PH/AU/CN/FJ
Carbon dioxide	5.54	4.07	4.26	AU/NZ/SG
Hydrocarbons				
Other additive oils	2.79	1.54	2.24	AU/NZ/SG
Hydraulic fluids & oils	8.03	5.17	4.37	AU/NZ/MY/MC
Kerosene	2.5	4.79	0.61	SG/AU
Grease-lubricating oil	224.57	188.39	188.25	MY/AU/NZ
Butane	264.42	268.34	218.84	AU/NZ
Aviation fuel	249.34	269.23	204.99	AU
Coal tar	268.67	203.11	32.32	FJ
Pulp (Unleaded Petrol)	600.47	615.4	476.06	SG
Gasoil (Diesel)	2,916.99	2,973.09	2,189.94	SG
Miscellaneous	70.63	10.45	23.53	MC
Agriculture support chemicals				
Fungicides	0.78	0.47	0.99	AU/NZ
Herbicides	5.61	5.7	2.42	AU/NZ/CN
NPK based Fertilizers	2.13	0.93	1.27	AU/NZ
Miscellaneous	2.35	5.12	1.56	AU/NZ/MC
Mosquito spray/Coils	7.81	10	11.6	CN/AU/FJ/MC
Insecticides	4.97	44.18	35.76	CN/AU/NZ/MC
Alcohols				
Alcohol (80% or more)	3.3	1.4	5.4	AU/NZ/FR/MC
Alcohols (>37 & <80%)	49.7	76.2	51.2	AU/NZ/FR/MC
Miscellaneous	227.2	277.3	231.6	AU/NZ/FR/MC
Alcohols (<10 & <37%)	203.5	184.9	207.7	AU/NZ/FR/MC
Cosmetic compounds				
Eye make-up products	1.47	1.79	1.93	AU/US/HK/MC
Lip make-up products	2.23	2.2	2	AU/CN/FJ
Manicure/pedicure products	4.06	3.31	2.97	CN/AU
Hair lacquers	4.08	1.91	3.84	HK/TH/CN/MC
Powders (Baby/talcum etc)	6	5.98	5.92	ID/FJ/MC
Oils (Hair/eucalyptus/baby)	10.94	15.06	24.58	MC
Shampoo products	23.96	27.53	15.59	MC
Perfume products	73.45	63.13	72.96	AU/MC
Disinfectants	7.52	8.47	11.97	AU/NZ/CN/FR
Washing powder	4.69	2.4	7.44	MC
Soaps/products	152.39	152.5	164.85	MC
Miscellaneous	72.01	650.31	181.8	MC

Pharmaceuticals				
Vaccines – veterinary	3.68	2.75	4.12	AU/NZ
Vaccines – human	12.39	10.13	8.4	AU/NZ
Penicillin's & derivatives	12.01	6.93	30.99	NZ/MC
Corticosteroid hormones	27.62	20.74	27.19	NZ/MC
Dental fillings/cements	6.9	3.76	0.84	AU/NZ
Cerazette	35.87	60.21	41.71	NZ
Leflunomide	24.69	67.35	64.14	NZ
Diagnostic or lab reagents	18.67	12	16.78	AU/US
Petroleum jelly	0.12	0.87	1.97	AU/NZ/CN/MC
First aid boxes & kits	3.05	2.62	2.71	AU/NZ/MC
Vitamins/Supplements	15.69	6.79	8.05	MC
Adhesive dressings	4.36	8.49	3.58	AU
Other antibiotics	13.27	21.59	37.26	AU/NZ
Miscellaneous	600.44	611.45	521.48	MC
Construction support compounds				
Putty / Fillers / Sealants	12.35	8.15	9.78	MC
Cement	409.28	450.83	497.15	MC
Paints and printing compounds				
Dyes	2.81	1.96	3.01	CN/MC
Finishing agents	2.55	1.81	1.65	MC
Polish materials	7.15	5.51	5.9	AU/CN/MC
Ink (Cartridge, printing etc.)	28.78	34.38	32.14	MC
Photographic products	99.86	117.96	103.31	AU/NZ/CN
Pigments	18.12	16.75	15.82	FJ/CN/AU
Thinners and varnish	9.61	10.18	7.41	FJ/CN/AU/NZ
Epoxide resins	13.28	17.5	1.93	AU/NZ
Miscellaneous	50.67	72.87	440.03	MC
Acrylic / vinyl polymers / paints	224.64	157.68	186.8	MC
Metal products				
Copper & its alloys	22.3	24.6	28.4	MC
Zinc products	0.3	1	1.05	AU/NZ/MC
Lead products	0.16	0.07	0.04	AU/NZ/MC
Stainless steel	69.1	70.8	44.2	MC
Products of Iron & Miscellaneous	1656.2	1697.2	1603.6	MC
Rubber products				
Rubber products	158.63	135.62	120.97	AU/NZ/CN
Tyres	146.25	150.29	122.76	CN/TH/MC
Rubber products				
HS 25 Miscellaneous	4.66	2.12	1.4	MC
HS 38 Miscellaneous	26.04	25.49	27.5	MC
Biodegradable products	11.03	6.91	4.12	CN/MC
Plastic products	931.74	881.46	903.34	CN/AU/MC

* AU – Australia ; CN – China ; FJ – Fiji ; FR – France ; ID – Indonesia ; IN – India ; HG - Hong Kong ;
MC – Multiple Countries ; MY – Malaysia ; SG – Singapore ; TH – Thailand ; NZ – New Zealand ; PH – Philippines

3.3.14 Hazard classification of imports

All chemical imports listed in the current consultancy have been classified into their health and environmental impact. This classification is important to assess the status of the chemical and take appropriate precaution/s during import/ storage/usage and disposal. The classification is shown in Table 3.6. Most of the chemical imports comes under irritants and considerable number of corrosive, carcinogenic and harmful to environment being currently under use in Vanuatu.

Table 3.6 Hazard classicification

	CHEMICAL NAME	Irritant	Corrosive	Flammable	Carcinogen	Toxic	Environmental hazards	Acute Toxicity	Explosive	Not Harmful
INORGANIC COMPOUNDS	Calcium Hypochlorite	✓	✓				✓	✓		
	Sodium Bicarbonate							✓		
	Potassium hydroxide	✓	✓					✓		
	Various sodium compounds									
	Heating gels	✓		✓						
	Sodium hypochlorite		✓				✓			
	Matches			✓						
	Magnesium chloride	✓	✓							
	Magnesium sulphate	✓								
	Calcium carbonate									
	Calcium chloride					✓				
	Calcium carbide	✓	✓	✓						
	Calcium oxide	✓	✓							
	Aluminium sulphate		✓							
	Boric acid				✓					
	Iodine/Iodide	✓			✓					
	Hydrogen peroxide	✓								
	Silver nitrate					✓				
	Barium compounds									
	Zinc compounds									
	Potassium permanganate	✓				✓				
	Titanium oxide				✓					
ORGANIC COMPOUNDS	Ethyl Glycol	✓								
	Methyl alcohol			✓	✓					
	Isopropyl alcohol	✓	✓							
	Sodium Benzoate	✓								
	Monopropylene glycol									
	Monoethanolamine	✓	✓							
	Urea	✓								
	Saccarin & salts	✓								
	Carbon tetrachloride	✓				✓				
	Glutamic acid & Salts	✓								
	Anti-freezing							✓		
	Miscellaneous									
	Acetone	✓		✓						
	Toluene	✓		✓						
	Candles/Wax									
	Tobacco									
	Adhesives	✓								
	Trimethylolpropane				✓					
	Dimethylaniline				✓	✓				
	Morphine	✓								

Table 3.6 Hazard classicification Cont.

	CHEMICAL NAME	Irritant	Corrosive	Flammable	Carcinogen	Toxic	Environmental hazards	Acute Toxicity	Explosive	Not Harmful
	Glycerol	✓								
	Lactic acid and its salts		✓							
	Nonyl phenol	✓	✓		✓		✓			
ORGANIC & INORGANIC ACIDS	Sulfamic acid	✓								
	Acetic acid			✓						
	Oxalic acid	✓								
	Formic acid		✓			✓				
	Phosphoric acid	✓								
	Nitric acid									
	Citric acid	✓								
	Sulfuric acid		✓							
	Hydrochloric acid	✓	✓							
GASES	Acetylene			✓					✓	
	Helium								✓	
	Refrigerant	✓							✓	
	Nitrogen	✓							✓	
	Oxygen								✓	
	Argon									
	Carbondioxide									
HYDROCARBONS	Hydraulic fluids and oils									✓
	Kerosene	✓		✓		✓	✓			
	Grease lubricator	✓					✓			
	Butane			✓						
	Aviation fuel	✓		✓	✓		✓			
	Coal tar	✓			✓		✓			
	Gas oil	✓		✓	✓		✓			
AGRICULTURAL PRODUCTS	Fungicides	✓								
	Herbicides				✓					
	Insecticides						✓			
	2,4-D (Dichlorophoxyacteic acid)	✓	✓							
	Glyphosate	✓								
	Metsalfuron		✓				✓			
	Paraquat	✓				✓				
	Picloram	✓				✓	✓			
	K-ethephon	✓	✓				✓			
	DSMA	✓				✓				
	Bifenthrine	✓			✓	✓	✓			
	Rodent bait				✓					
	Permethrine	✓					✓			
	Temprid	✓								
	Fibronil				✓	✓	✓			

Table 3.6 Hazard classicification Cont.

	CHEMICAL NAME	Irritant	Corrosive	Flammable	Carcinogen	Toxic	Environmental hazards	Acute Toxicity	Explosive	Not Harmful
	Secrila						✓			
	Amdro					✓	✓			
COSMETIC COMPOUNDS	Eye make-up products									✓
	Lip make-up products									✓
	Manicure products									✓
	Hair acquers									✓
	Powders									✓
	Oils									✓
	Shampoo products									✓
	Perfume prodcts									✓
	Disinfectants	✓								
	Washing powder	✓								
PHARMACEUTICALS	Vaccines- Veterinary	✓								
	Vaccines-Human									
	Penicilin									✓
	Corticosteroid hormones				✓					
	Cerazette				✓		✓			
	Leflunomide					✓				
	Diagnostic/lab reagents									
	Petroleum Jelly									✓
	Vitamins	✓								
CONSTRUCTION COMPOUNDS	Putty/Fillers/Sealants									✓
	Cement	✓	✓							
PAINTS & PRINTING COMPOUNDS	Dyes									
	Finishing agents									✓
	Polish materials									✓
	Ink (Catdrige)	✓			✓					
	Photographic products									
	Pugments	✓								
	Thinners and varnish	✓		✓	✓					
	Epoxide resins	✓								
	Acrylic/vinyl polymer paints	✓			✓					
METALS	Copper & its alloy	✓				✓	✓			
	Lead compounds	✓					✓			
	Stainless steel	✓			✓					
RUBBER PRODUCTS	Rubber products	✓				✓				
	Tyres	✓								

Chapter 4

Chemical and Waste Management

Chemical and Waste Management

This chapter covers the general discussion on chemical and waste management practices along with the current status of chemical and waste management practices that are being observed at various places.

4.1 Introduction

The First International Programme on Chemical Safety (IPCS) was established in 1980 with the World Health Organisation, the International Labour Organisation, and the United Nations Environment Programme as collaborative partners. The aim of this program was to establish a scientific basis for safe use of chemicals and to strengthen national capacities for chemical safety (WHO). Adopted by the First International Conference on Chemical Management (ICCM) on 6th February, 2006 in Dubai, the Strategic Approach to International Chemicals Management (SAICM) is a policy framework to promote chemical safety around the world (SAICM). The conference declared, "The sound management of chemicals is essential if we are to achieve sustainable development, including the eradication of poverty and disease, the improvement of human health and the environment and the elevation and maintenance of the standard of living in countries at all levels of development". It further stated that, "**Significant, but insufficient, progress has been made in international chemicals management**" through the implementation of Chapter 19 of Agenda 21 Safety in the "Use of Chemicals at Work" and No. 174 on the "Prevention of Major Industrial Accidents" and the "Basel Convention", the "Rotterdam Convention" and "Pesticides in International Trade" and the "Stockholm Convention" and the adoption of the Globally Harmonized System for the Classification and Labeling of Chemicals".

Hazardous chemicals can be found in the air, consumer products, at the workplace, water, or in the soil, and can cause a large variety of diseases. Many more diseases, such as mental, behavioral and neurological disorders, adverse pregnancy outcomes, cataracts, or asthma, could be prevented by reducing or removing chemical exposure (WHO[2]).

The 2018 data addendum of WHO estimated that 1.6 million lives and 45 million disability-adjusted life-years were lost in 2016 due to exposures to selected chemicals. It further reported that, this was higher than the 2016 report estimate of 1.3 million lives and 43 million disability-adjusted life-years lost in 2012 (WHO[3]).

It also opined that data was however only available for a small number of chemical exposures and people are exposed to many more chemicals every day. The WHO and Global Health Data Exchange reported that 44% of the above deaths in 2016 are due to cardiovascular diseases and 26% from various forms of cancers and 14% from self-harm. These statistics clearly indicate there is a great need for countries and stakeholders to oversee their chemical management with stringent regulations as any lapses would lead to human loss, either instantaneously or by slow poising death.

The UN's Sustainable Development Goals (SDG) agenda for 2020 aimed under SDG 12.4 was to "Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle in order to minimize their adverse impacts on human health and environment". Further, SDG 3.6 for 2030 was to reach "Substantially reduce the number of deaths and illness from hazardous chemicals" and "To achieve these, there needs continuous and collective efforts from various sectors". WHO identified cooperation with the following sectors may be required to sustainably reduce risk to health. They include, water and sanitation, industry, housing, agriculture, labor and health. According to Gayle Holmes, New Zealand's EPA's General Manager of Compliance, Monitoring and Enforcement, "Chemicals touch every area of our lives, and the world of chemical management is dynamic and fast-moving, so it's important we stay on top of best practice" (EPA-NZ).

4.2 Chemicals Management

The increased reports of chemical accidents all over the world constantly remind to have sound management of

chemicals at all places and times. Even though most care is concentrated on hazardous chemicals, there is a growing need to have safe management of all available chemicals at any given workplace. The management in general starts from the entry point of any country and continue with various phases like storage at entry point (wharf /airport / borders), local transport, storage, usage and disposal. All these phases shall have their own importance in keeping the chemicals under safe management to avoid any accident both to humans and environment. UNEP's "**Practices in the Sound Management of Chemicals**" stated that,

> "The sound management of chemicals, including hazardous wastes, aims to prevent and, where this is not feasible, to reduce or minimize the potential for exposure of people and the environment to toxic and hazardous chemicals as well as chemicals suspected of having such properties. It includes prevention, reduction, remediation, minimization and elimination of risks during the life cycle of the chemicals: production, storage, transport, use and disposal, including the risks from chemicals found in products and articles" (UNEP).

It is further outlined that the application of the sound management of chemicals is based on, Pollution Prevention, The Precautionary Approach, Internationalization of Environmental and Human Costs, and Right to Know. It may not be practical in all cases/countries to fully follow/monitor these but there is an increasing need to implement these for the sound management of chemicals. Especially in small island countries with limited technical staff and financial implications associated with the administration, some of the well-established practices in the management are often seen impractical to implement in full force. Vincenten et al. (2020) reported that according to the WHO-European Region stakeholders' views, cross cutting issues, such as legislation strengthening and enforcement, further collection of information, capacity building, education and awareness rising were considered priority in improving chemicals management.

WHO's International Programme on Chemical Safety publication on "The Public Health Impacts of Chemicals: Knowns and Unknowns", reported that the best way to identify various chemical exposures can be known by the Prüss-Ustün et al. (2011) model. The chart is a comprehensive origin-exposure-safety of chemicals on humans and is shown in Fig. 4.1. It was reported that "unintentional poisonings" at home and workplace annually cause 193,000 deaths and these are preventable chemical exposures (Prüss-Ustün et al., 2016; WHO, 2015). According to the International Health Regulations (2005), parties are required to have or develop minimum core public health capacities to detect, assesses and report public health events, including chemical accidents and emergencies and in 2014 data from 160 countries showed that the chemical sector is the least among all others (WHO, 2016). This again clearly reflect the low priority by developed states in having sound chemical management strategies and when implied to developing, low income or small island countries, the levels of readiness and management can be imagined.

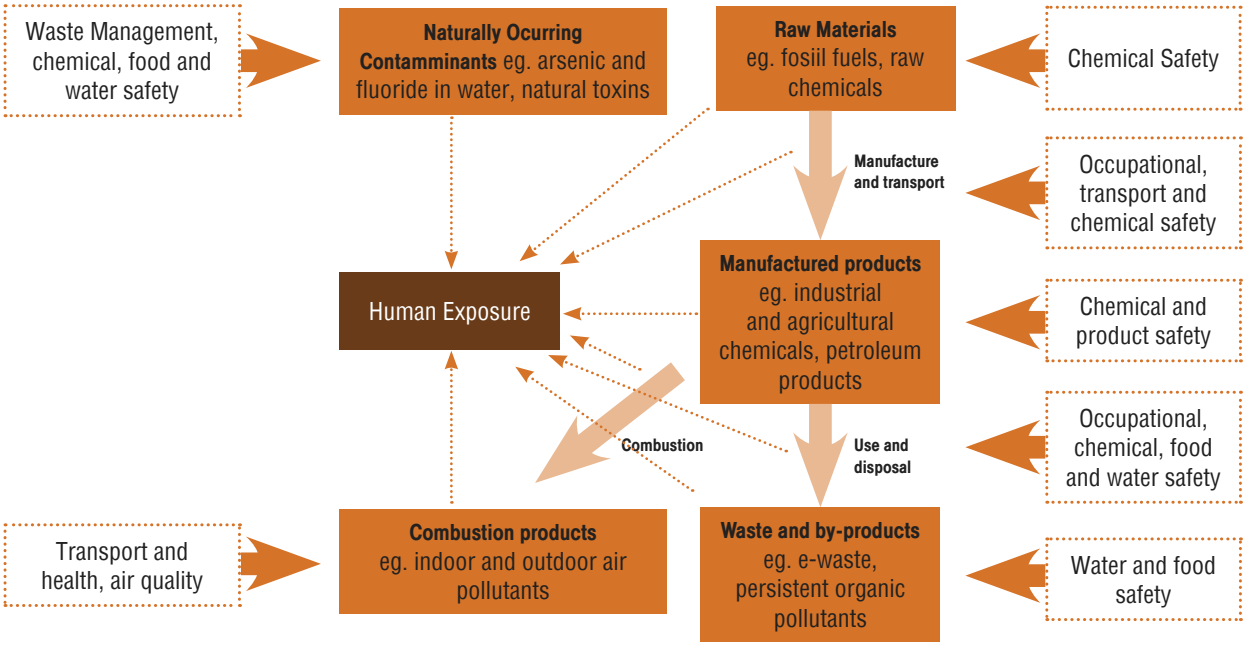

Fig. 4.1 Human exposure to chemicals (Prüss-Ustün et al., 2011)

4.3 Transport Mechanisms

The "Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was adopted in 1957 by United Nations Economic Commission for Europe (UNECE) and entered into force on 29th January, 1968. Even though, Vanuatu's geographical structure wouldn't suit for this mode of transport but there are useful insights provided in regard to the conditions and construction and operation of vehicles that usually transport these goods and some of these can be applied for inland transport as well. The United Nations Transport of Dangerous Goods Classification is given below in Table 4.1.

The International Labor Organisation define "Dangerous Goods" as potentially explosive, flammable, toxic, radioactive, corrosive or harmful in some other way to humans, animals or the environment. The environment includes other goods in transport, the transport vehicle, buildings, soil, roads, air, waterways and nature in general. UN statistics show that half of all goods transported belong to the category of dangerous goods (ILO). ILO further noted that "spillages" are possible in the following situations:

- goods are not properly packaged
- handling (loading, unloading, etc.) is done without reference to the contents, (perhaps because of missing or incomplete labelling)
- fire; either when the load or the vehicle is burning
- collision or capsize
- defected tightness or incomplete closing of valves and connections

It further stated that, "Recommendations and instructions for the handling, storage and transport of dangerous goods must be clear and unambiguous to avoid harmful or dangerous circumstances".

As part of the consultancy various stakeholder sites were visited to see their current chemical management practices in transport. They included public and private firms, educational institutions, various chemical testing laboratories, dumping sites, hospitals, public storage/ dump yards etc. As a general practice most the private stakeholders didn't allowed to have pictorial evidence of their transport (site as well) facility.

Pacific Energy is the supply of petroleum products in Vanuatu with a storage capacity of 17.2 million liters and usually transport with oil tankers for supply to outlets. The transport is being done with the tankers from Petrocean

Table 4.1 UN Dangerous Goods Classification

Classifications	Goods	Symbol
1	Explosives	
2	Gases: Compressed, liquefied or dissolved under pressure	
3	Flammable Liquids	
3.1	Flammable Liquids with a flashpoint below 23°C	
3.2	Flammable Liquids with flashpoint of 23°C and more, up to an including 61°C	
4.1	Flammable Solids	
4.2	Flammable Solids, substances liable to spontaneous combustion	
4.3	Flammable Solids, substances emitting flammable gases when wet	
5.1	Oxidizing Agents	
5.2	Organic Peroxides	
6.1	Toxic Substances	
6.2	Infectious substances	
7	Radioactive Substances	
8	Corrosive Substances	
9	Miscellaneous Dangerous Substances	

Company which operates oil tankers in the Pacific region as well (Fig. 4.2). It was noted that these are made with international standards for these operations with experienced and certified drivers for the safe transport. Local inter-island transport of goods is generally serviced by two major ferry ships, Vanuatu Ferry and Big Sista (Fig. 4.3). These two carry all general commodities, construction, automobile etc. on daily schedules. As a normal crowded and busy ferry transport facility, these generally don't follow all the rules applied for the safe transport of the goods, which are not all dangerous but are of various chemical compositions. The local super markets / small stores have their own private transports that are being used for the local travel of all the goods. In general it is noted that there are no specific regulations being followed in transport of any chemical composition materials like oils, cleaning agents etc., but are transported as normal with other commodities of use.

Fig. 4.2 Pacific Energy oil tanker

Fig. 4.3 Big sista ferry (Courtesy : Dailypost)

4.4 Labeling

The United Nations Economic and Social Council's Committee of Experts on the Transport of Dangerous Goods (UNCEDTG) had made work on a single, globally harmonized system in having classification of chemicals, labels and safety data sheets (UN GHS, 2011). During 1992 United Nations Conference on Environment and Development (UNCED) it was adopted that "A globally harmonized hazard classification and compatible labeling system, including material safety data sheets and easily understandable symbols, should be available, if feasible, by the year 2000". The first published work of Globally Harmonized System (GHS) was done in 2003 with updates of every two years. The UN Secretariat opined that, availability of information about chemicals, their hazards, and ways to protect people, will provide the foundation for national programmes for the safe management of chemicals. There has been a great progress in the implementation of GHS all over the world but there are gaps to address as well. As noted during the HS data verification done in Chapter 3, there are many mismatches being observed and of-course some of them may be manual but there needs a complete co-operation from the industrial partners in having proper labeling with good description of goods during import/ export.

The GHS had published several global labeling standards that should be followed to have uniformity all the world during imports and exports. Following are some of the standard set symbols according to UN Recommendations on the Transport of Dangerous Goods, Model Regulations (Fig. 4.4).

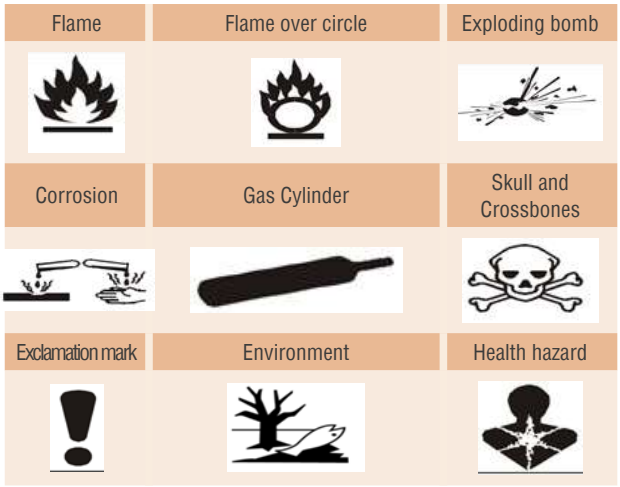

Fig. 4.4 UN Model regulations of Dangerous Goods

The role of safety data sheet (SDS) considered very important as part of the harmonized system. GHS refers SDS as "should provide comprehensive information about a substance for mixture for use in workplace chemical control regulatory framework". UN in harmonizing the development of SDSs delegated a sixteen header to best describe and are shown in Fig. 4.5.

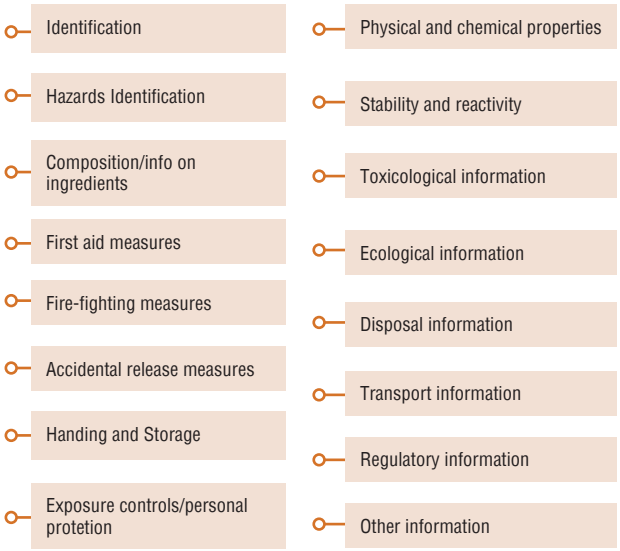

Fig. 4.5 GHS Safety Data Sheet Headers

During the consultancy visits, discussions and material submitted, only very few are aware of the term "SDS". Only three stakeholders have provided these data sheets of the chemical products they are using/selling.

These clearly indicate that the current status of knowledge and preparedness in case of any chemical accidents at any work/storage site. Given the increase in chemical accidents and health related issues of chemical usage and storage, labeling should be practiced by all stakeholders for sound chemical management. The GHS labeling for the acute toxicity is as follows for all chemicals is shown in Table 4.2.

Table 4.2 GHS labeling for acute toxicity

	Category 1	Category 2	Category 3	Category 4	Category 5
Symbol	Skull & Crossbones	Skull & Crossbones	Skull & Crossbones	Exclamation mark	No symbol
Signal word	Danger	Danger	Danger	Warning	Warning
Hazard statement Oral	Fatal if swallowed	Fatal if swallowed	Toxic if swallowed	Harmful if swallowed	May be harmful if swallowed
Dermal	Fatal in contact with skin	Fatal in contact with skin	Toxic in contact with skin	Harmful in contact with skin	May be harmful in contact with skin
Inhalation	Fatal if inhaled	Fatal if inhaled	Toxic if inhaled	Harmful if inhaled	May be harmful if inhaled

The field inspections at various places as part of the consultancy had showcased some of the best and poor practices in labeling of the site and at chemical storage spaces. Some of these displays are shown in Fig. 4.6 and 4.7.

Fig. 4.6 Good chemical labelling practices at work places

Fig. 4.7 No chemical labelling practices at work places

4.5 Storage

Among the many objectives of The Strategic Approach to International Chemicals Management (SAICM), "safe storage" was one of the priorities to be achieved by 2020 as part of sound management of chemicals (WHO[4]). But this ambitious goal had made some progress but still chemical accidents have been regularly reported all over the world due to non-compliances in the storage protocols. The FACTSONLINE website has a database of over 25,700 hazardous accidents that took place over the last nine decades world-wide. Not all might be related to storage but clearly indicate the importance of following proper storage protocols for sound management of chemicals at all times. A recent case of storage accident that shocked world when two explosions occurred on 4th August 2020, at the port of the city of Beirut, the capital of Lebanon and caused at least 157 deaths (including firefighters), 6000 injuries, and US$10–15 billion in property damage, leaving an estimated 300,000 people homeless (Factsonline). This incident triggered a wide-range of massive inspections in the ports and warehouses all over the world to check the storage status of chemicals. In-fact in most other places in the world were altered to review their storage facilities but again these trigger incidents create sudden rush and due lapses arise in long run at some places where monitoring is not maintained.

The United Nations Environment Programme in its publication "A Technical Guide for Safe Warehousing of Hazardous Materials" outlined a check-list for safe management. This check-list includes:

- Location and Buildings
- Warehouse Management
- Hygiene and Personal Safety
- Spillages
- Waste Disposal
- Fire and Environmental Protection

Added, it also highlighted under "Key Responsibilities", the role of Authorities (National, Regional and Local), the Supplier or Owner of the Goods and the Warehouse keeper. This clearly indicates that safe storage is a collective effort for sound management of chemicals. Jiang et al. (2020) reported that human factors are important causes of hazardous chemical storage accidents, and clarifying the relationship between human factors can help to identify the logical chain between unsafe behaviors and influential factors in accidents. The consultancy visits witnessed some good and bad storage facilities and some examples of these are shown in Figs. 4. 8 and 4.9.

However during the consultancy visits, it was observed that most of the above said important factors in the check list were not being in order or in some cases were not aware of these. This clearly indicate the poor understanding of storage importance of chemicals and thus needed to have specific legislation at national level to have uniform practice for safety of workers and workplace. It is also noted during the inspections that there haven't been any visits from DEPC to check theses storage places and thus there is a need for periodic monitoring to evade any chemical accidents due to storage mismanagement.

It was brought to the notice of the consultant that some of the newly established fuel stations in towns and small container storage delivery modes in outer islands are in the vicinity of houses and public buildings. These cases should be discussed with municipal to have proper protocols in allocation of appropriate place.

Fig. 4.8 Good chemicals storage practices

Fig. 4.9 Poor chemicals storage practices

4.6 Chemicals and Waste Management

It is a well-known fact that there is a thin line at times that differentiates between chemical and general waste. As often, the word "waste" is complex in its term and context, with limited specificity as in many cases both chemical and general waste do generate/move together. As a result it is imperative that chemical waste management comes under the broad area of waste management. Waste management is a universal challenge and no country is spared by its menace. As It is a well-known fact that liike many other Small Pacific Island Countries, Vanuatu has been facing challenges in its waste management mainly due to its geographical constrains and with many small islands (Morrison et al., 1999; JAICA, 2006; Mohee et al., 2015). According to Vanuatu National Waste Management Strategy and Action Plans 2011-2016, a Waste Minimization and Management Policy 2001 (VWMP) was in force for Vanuatu where its goal is to prevent, protect, and control the adverse effects of waste on human health, environment, and the economy of the country (VNWMSAP, 2011). It further stated that according to "Priorities and Action Plan Agenda 2006-2015", the assessment of waste disposal issues as a moderately high priority issue for many islands. VNWMSAP reported that VWMP was never in operation and many of the recommendations were not realized. However, VNWMSAP did had its limitations.

The above observations of non-functional policy and non-coverage of important wastes in the VNWMSAP do indicate the status of waste management in Vanuatu. Indeed some progress was achieved in recent years with various developmental partners, especially Japan International Cooperation Agency (JICA) and The Secretariat of the Pacific Regional Environment Programme (SPREP). Asian Development Bank reported in its 2014 study that only about half of the generated waste was usually collected, where the other half being dumped or burned (ADB, 2014).

The wastes which were not covered under VNWMSAP strategy include:

- Liquid wastes (such as raw sewage and other wastewaters)
- Gaseous wastes
- Hazardous wastes (such as Persistent Organic Pollutants, POPs) which will be addressed by the Stockholm Convention & National Implementation Plan (NIP)

It further expected for coming next twenty years roughly 145 tons of daily waste being generated. JICA (2006) reported that around 70% of the solid waste that come to Bouffa landfill (Fig. 4.10) in capital Port Vila do contain organic material and thus can controlled with proper management.

Fig. 4.10 Bouffa landfill dumping collection and site

As indicated earlier, most of the stakeholders are reluctant to share their chemical waste management strategies / methods as well as to show their systems or allow to take pictures of waste storage / disposal sites. It is clearly evident that there are no proper protocols being followed in the chemical waste storage or discharge. This was even reported in a recent waste oil report submitted by Araspring Ltd. (Used Oil Report, p17). But there are some stakeholders who do follow some protocols and methods to dispose their chemical waste. This does indicate that there is little awareness among some stakeholders in regard to proper treatment and disposal of wastes, which is a good sign to improve.

4.6.1 Chemicals Waste Disposal

Vanuatu Brewing Limited has recently treating its chemical waste water by open aeriation bubbling technique beside its factory in Port Vila. All the waste generated by different cleaning or solution making machines is directed to a large open air tank where a twenty hour bubbling for aeration is arranged for open evaporation (Fig. 4.11). It was informed that the set-up was made in line with Department of Water Resources directions for effective drainage treatment of waste water with a protective plastic coverage at the bottom from any non-seepage of any leachate for groundwater contamination. At the Vila Central Hospital (VCH), all the hospital waste is being subjected to incineration (Fig. 4.12) and the generated ash being dumped at the Bouffa landfill.

Fig. 4.11 Open aeration system

Fig. 4.12 Incinerator at Vila Central Hospital

It was also observed that some private clinics started to collect their waste and handover to VCH for incineration with small waste collection bins (Fig. 4. 10).

Whereas, in Lenakel Hospital in Tanna the incinerator is not working and all the waste is being dumped in a land pit dug next to the incinerator room. It was reported that in other islands where there are no incinerator, the waste being burnt in an open space and remnants are buried. In most places, especially in educational institutions there are no protocols for chemical waste management and thus labs are being stockpiled with unused/expired chemicals. Some of these dates back to around twenty to thirty years back (Fig. 4.13). The teachers reported that they are unaware of the disposal methods and thus the school is keeping them all these years.

Fig. 4.13 Stockpiles of expired/unused chemicals in schools

It is a well-known fact that waste oil management is an increasing concern for many countries in the world and Vanuatu with its growing needs of various oil products is no exception. Muncie Sanitary District defined it as "insoluble, persistent, slow to degrade, sticks to everything from beach sand to bird feathers, and can contain toxic chemicals and heavy metals that pose a health threat to humans, plants, and animals". If further stated that, an estimated 200 million gallons of used motor oil is improperly disposed of each year in the U.S. by being dumped on the ground, tossed in the trash (ending up in landfills), and poured down storm sewers and drains (MSD). The World Environment Conference held in Kyoto in 1997 confirmed the drastic need to reduce petroleum waste discharge into the environment (Leask, 1998). Health hazards of ingested waste-oil-contaminated water range from mild symptoms of accumulation of toxic compounds in the liver to complete impairment of body functions and eventually death (Noln, 1990).

SPREP report for In-country Waste Oil Audit for Vanuatu in 2013, reported that, "Pacific Petroleum operates a waste oil take-back scheme for their customers (but only for their customers), and they are currently recovering up to around 125,000 litres per year, or about 30% of their past imports. This is quite a respectable recovery rate because it is generally recognised that only about 50% of the oil sold will end up as waste".

Araspring Ltd. in its "Used Oil Report – Fiji, Niue, Kiribati, Vanuatu, SCL – 2018", stated that, "Pacific Energy Vanuatu receives back about 60,000 – 80,000 litres per year and they sell about200,000 litres per year. They were reluctant to give the exact figure. Other parties in Vanuatu also sell lubricating oil, including Trade Tools, but PE is the only company that takes back used oil" (Araspring Ltd, 2018). It further reported that, "In Vanuatu they currently send all the used oil they collect to the Copra Plant in Espiritu Santo. This is a somewhat insecure outlet for their used oil, however, and they would appreciate an alternative".

These reports suggest that "there is a need for Vanuatu to have a better collection and disposal practice of waste/used oil in the country. There is a need for site inspections and sample testing's to be done for the soil and water samples in and around these storage facilities and recommend appropriate protocols for better storage and transport as per standards". The consultant herewith agrees with the above observations and recommends implementing the same as reported earlier along with the current recommendations.

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Chapter 5

Legislative and Institutional Infrastructure

Legislative and Institutional Infrastructure

This chapter discuss the Department of Environmental Protection and Conservation's role and legislations related to waste management and pollution control. Also covers the present human resource capacity for the above administration.

5.1 Introduction

The Department of Environmental Protection and Conservation (DEPC) was established in 1986. DEPC is under the Ministry of Climate Change Adaptation, Meteorology and Geo-Hazards, Environment and Disaster Management. DEPC's with its promoter statements of "Think Environment First: Show People" and "Leading Vanuatu to a clean, resilient and sustainable environment" is responsible for the Environmental Protection and Conservation Act (CAP 283). The act entitles DEPC to develop, coordinate and implement Vanuatu Government's environmental policies and programs. The core responsibilities of DEPC include;

- Environmental Impact Assessments of proposed developments
- Community engagements on Community Conservation Arears
- Protection of endangered species
- Control of Ozone depleting substances
- Working with municipal and provincial government to manage and pollution
- Collaborative research in understating the unique environment of Vanuatu

DEPC indicates its main departmental functions as follows:

- Promote clean development in Vanuatu
- Build resilient communities who will be able to adapt to climate change
- Encourage and support sustainable resource management and conservation
- Promote a green economy
- Work towards sustainable development
- Explore the development of a carbon scheme for Vanuatu
- Promote clean development in Vanuatu
- Build resilient communities who will be able to adapt to climate change
- Encourage and support sustainable resource management and conservation
- Promote a green economy
- Work towards sustainable development

5.2 DEPC's Legislations

5.2.1 Vanuatu's Environmental Protection and Conservation Act

Vanuatu alongside being party to many protocols had developed its own national policy that would safeguard its environment and refers it as "Environmental Protection and Conservation Act" and is the overarching environmental law of the country. This law covers Administration, Environmental Impact Assessment (EIA) and Biodiversity. According to DEPC, the act originally started as the Environmental Management and Conservation (EMC) Act in 2002 and underwent some amendments in form of "EMC Amendment in the Statue Law (Miscellaneous) Provisions Act No. 2 of 2010 and EMC Amendment Act No. 28 of 2010.

Under this act, section 44 dealing with "Regulations", it was stated that, "The Minister may make regulations with other Ministers, related to,

a. regulating the environmental effects of:
   ii. the importation and transportation of hazardous substances;
   iii. waste management;
   iv. air and water pollution;

This clearly shows that there is a standing legislation that can deal with chemical importation and pollution impacts. But as of today, there are no specific legislation/s that directly deals with any breaches either in transport, storage and waste management of chemicals. Currently this comes under the broad area of "Pollution Control". There is a good mention of duties of "Enforcement Officer" in regard to inspections/claims for damage and penalty for any breaches of the act but it seems there needs to be specific discussion/ directions in regard to quantifying this directly related to chemical management.

In the "Environmental Impact Assessment Regulations Order No. 175 of 2011" it was mentioned in Schedule 1 that activities like mining, quarrying, fish and meat processing plants,

canneries, oil mill, breweries and beverage production, service and fuel stations, manufacture of chemicals, landfill sites etc., needs to have "**Preliminary EIA**". The current consultations concluded that there should also be a "Post EIA" on bi-annual basis to oversee the implications of the operations in their sound chemical management, pollution control measures and impact on environment.

5.2.2 Vanuatu's Waste Management Act

Vanuatu is implementing "Waste Management Act" since June 2014 for effective waste services and operations for the protection of environment. The act covers in identification, collection, disposal, planning and managing hazardous waste. It was stated that this shall be coordinated effort of DEPC, Municipal and Provincial Councils, Ministry of Health and Biosecurity. Further on 1st February, 2018 three orders (Official Gazette No. 10 of 2018) under the Act were issued in regard to ban certain non-biodegradable plastics usage, littering and licensing of private waste operators in Vanuatu. The ban on single use plastic came to force from 1st July, 2018 and considered one of the major steps in waste management in Vanuatu.

The Act defines "Environment" as "environment includes all natural, physical and social resources and ecosystems or parts thereof, people and culture and the relationship that exists between these elements". Further, Hazardous waste or Hazardous substance is defined as "hazardous waste and hazardous substance means:

a. any waste or substances which are, or which have the potential to be, toxic or poisonous, or which may cause injury or damage to human health or to the environment, including all persistent organic pollutants; and
b. any specific substance, object or thing determined under any law to be a hazardous waste or a hazardous substance; and
c. any other matter or thing deemed under international conventions applicable to Vanuatu to be hazardous waste or hazardous substances, or to have the characteristics of hazardous waste or substances.

National Waste Management and Pollution Control Strategy (NWMPCS) continues to update with various implementations of the National Waste Policy 2001. Last year was the end of the revised "National Waste Management and Pollution Control Strategy and Implementation Plan 2016-2020 (NWMPCSIP)". The document suggests that Vanuatu would be guided by a core principle of, Reduce, Reuse and Return (3R) alongside with other principles in line with "**Cleaner Pacific 2025**" strategy.

The National Waste Management Flow reported that according to 2019 data around 114 tonnes of waste per day is being generated (NWMF). It is interesting to note that the capital, Port Vila's waste generation was 58 ton/day. The report further detailed that through "Waste Collection", 49.2 (43.1%) tonnes was collected per day, whereas 47.6 (41.7%) ton was regarded as "Unmanaged Waste", 14.3 (12.5%) ton was "Self-disposal" and 3 ton/day (2.6%) was labelled as "Home Compost". It was reported that only 3.2 ton/day was recyclable waste. There is no specific mention of any chemical/substance related waste composition/s collected in the flow. In-spite of some good collection (public and private) systems available in the country, there is still an urgent need to strengthen the collection system, especially in remote communities. Those local damping's or burning shouldn't be considered as "small waste deposits" as years pass by, they certainly implicate many environmental challenges (Lakshmikantha, 2006; Wei, 2021).

It is noticed that, the issue of "non-separation of wastes" is another important component that correlates to the non-implementation of safe disposal of chemicals/substances associated. For instance, Sanma Province and Luganville Municipality Waste Management Plan 2013-16 reported that there was no such facility (SPLMWMP). It further stated that

> "There is currently no system whereby household hazardous waste such as oil, paint, chemicals or electrical goods etc. can be deposited/collected for safe disposal."

This further indicates that there has been no audit for amount of chemical/substance being collected/dumped at the sites or regulations for disposal. In their 2017-2021 plan, SPLMWMP reported that "we will carry out annual waste characterization study to ensure accurate data and assist in future planning" (SPLMWMP[2]). The draft also used many "we will" terms for 2017-2021 and it would be interesting to see how many of these are achieved as per the set goals for better waste collection and management.

In continuation of "Regional Solid Waste Management Strategy 2010-2015", SPREP in partnership with Japan International Cooperation Agency launched "Japanese Technical Cooperation Project for Promotion of Regional

Initiative on Solid Waste Management (J-PRISM)" in 2011. This collaborative initiative had brought forward some changes in the waste management with expertise planning and equipment donation. Currently J-PRISM phase II is underway for 2017-2022 with a theme of "Human and institutional capacity base for sustainable Solid Waste Management in the Pacific region is strengthened through implementation of Cleaner Pacific 2025". On 28th February, 2020, "The 1st National Solid Waste Management Planning Workshop" was conducted and it was reported that with better coordination among various departments, provincial councils and Japan International Cooperation Agency, better collection and management would be planned and implemented. In 2019, Vanuatu Recycling and Waste Management Association was launched. During the launch the Prime Minister said, "The challenges to our environment are immense and government cannot do everything. We need partnership. We need commitment. We need responsible citizens, and together we can create a healthy environment". He further noted that, I personally think it is a great initiative to complement the government's efforts to address waste management and control pollution "(Dailypost)". These policies and partnerships clearly indicate that there is a great concern for waste management.

5.2.3 Vanuatu's Pollution (Control) Act

The Pollution (Control) Act of Vanuatu was introduced in 2014 through the Act. No. 10 of 2013. The act was aimed to control the discharge and emission of pollution in Vanuatu. The Act defined,

> "Hazardous substances" as "any substance which is, or which has the potential to be, toxic or poisonous, or which may cause injury or damage to human health or to the environment, including all persistent organic pollutants"

and quoted that the definition also includes same as mentioned in international conventions as agreed by Vanuatu (Pollution Act, 2013). The Environmental Protection mission reads "An environmental sustainable Vanuatu in which all types of wastes are control, collected, reused, recycled and treated by environmental sound technologies suited to local conditions and waste going to landfill is minimized and pollution to the receiving environment, is within acceptable standards".

The Act does include all the modes of pollution, regulations, and authorities of DEPC and offence notices with consequences. It does include the authority to take samples for testing and analysis. There is clear mention of production of records and information to the management, storage, movement and disposal of pollutants. It is also mandated itself to remove, disperse, destroy and dispose of or otherwise deal with the pollutants (DEPC). DEPC also have its Environmental Impact Assessment process and it defines that, "An application must be submitted for any project that is likely to impact on the environment of Vanuatu and requires any license, permit or approval under any law" (EIA).

NWMPCSIP further noted that by 2018: "Waste Oil stewardship should be established and enforced, by 2020: "Waste management guidelines are in-force and implemented, by 2020: At least two pollution Control guidelines and strategies are developed and enforced, by 2020. It is unclear about the progress of these objectives and targets. "Vanuatu National Environment Policy and Implementation Plan 2016–2030" (VNEPIP)in its implementation plan for Policy Objective 3, aimed "By 2025, at least one chemical storage and disposal facility is established" and "By 2030, every province has a controlled waste disposal facility". It is hoped that these targets would be reached.

5.2.4 Vanuatu's Ozone Layer Protection Act

Vanuatu under the Vienna Convention (protection of the Ozone layer) and Montreal Protocol (on substances that deplete the Ozone layer) is providing Multi Level Funding for activities to protect the Ozone layer and currently Vanuatu is funded for Institutional Strengthening and HCFCs Phase out Management Plan. In line, Vanuatu established "Ozone Protection Act" in 2010 with further amendment in 2014. The act follows the international standards in prohibitions and restrictions on import of chemical compounds like methyl bromide, hydrochlorofluorocarbons (HCFCs), aerosol sprays, plastic foam, extruded polystyrene, thermoformed plastic packing etc. into Vanuatu.

5.2.5 International Chemical Conventions

Vanuatu through DEPC is part of many conventions and protocols that oversee the safe usage/transport of chemicals for the human and environmental well-being. Alongside the conventions that are directly related to chemicals, Vanuatu is also part of many other conventions that are related to its

environmental protection. The discussion here is specified to chemical conventions.

The Basel Convention

The first ever inter-county debate on hazardous wastes was conducted during the Basel Convention. On 22nd March, 1989 during the Conference of Plenipotentiaries in Basel, Switzerland, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted. The Basel Convention which entered into force 5th May, 1992 and states, "The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics, as well as two types of wastes defined as "other wastes" – household waste and incinerator ash". Vanuatu's Basel Convention's accession date was 16th October, 2018 and entry into force from 14th January, 2019.

The Rotterdam Convention

Meanwhile along the concerns of hazardous chemicals transport and management, the increase in usage of pesticides in agriculture further stressed the need to have more information exchange among countries about the constituents used in their preparations and their impacts on their environment on prolonged usage. Around 1980's the United Nations Environment Programme (UNEP) and Food and Agriculture Organization of the United Nations (FAO) developed and promoted voluntary information exchange programs. In 1985 FOA launched International Code of Conduct on the Distribution and Usage of Pesticides. London Guidelines for the Exchange of Information on Chemicals in International Trade was established in 1987.

During the Rio Summit in 1992, FAO and UNEP were tasked to have negotiations for the finalization of the text for the Convention on the "Prior Informed Consent Procedure for Certain Hazardous Chemicals in International Trade". On 10th September, 1998, The Rotterdam Convention was adopted by the Conference of Plenipotentiaries. The main aim of the Convention, to promote shared responsibilities and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment form potential harm and to contribute to their environmentally sound use by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions to Parties. These objectives are particularly important for developing countries that may lack capacity in chemicals management. The Convention entered into force on 24th February, 2004. Vanuatu's Basel Convention's accession date was 16th October, 2018 and entry into force from 14th January, 2019.

The Stockholm Convention

In view of the growing accumulation of pollutants, especially of organic in nature there were several reports that reported of their wide spread environmental and human impacts. The Persistent Organic Pollutants (POPs) of the organic compounds (Carbon based) are considered the most harmful. UNEP refers them to compounds that possess a particular combination of physical and chemical properties such that, once released in to environment, they remain intact for long periods of time, become widely distributed throughout the environment and accumulate in the fatty tissue and toxic to both humans and wildlife. It further stated that accumulation of some POPs would lead to cancer, damage to central and peripheral nervous systems, reproductive disorders and disruption of the immune system. To tackle these, The Stockholm Convention on Persistent Organic Pollutants was adopted by the conference of Plenipotentiaries on 22nd May 2002 in Stockholm, Sweden. The objective as set in Article 1 refers the Stockholm Convection is to protect human health and the environment from POPs. The Convention entered into force on 17th May 2004. Vanuatu's accession date was 16th September, 2005 and entry into force from 15th December, 2005.

Minamata Convention

The Minamata Convention on Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury and its products. It was agreed at the fifth session of the Intergovernmental Negotiating Committee on mercury in Geneva, Switzerland, on 19th January 2013 and adopted later that year on 10th October 2013 at a Diplomatic Conference (Conference of Plenipotentiaries), Kumamoto, Japan. The Convention entered into force from 16th August, 2017. Vanuatu's accession was from 16th September, 2018.

Waigani Convention

The Waigani Convention was aimed at the, Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region. The convention entered in to force in 2001 and parties of the convention include Australia, Cook Islands, Fiji, Kiribati, , New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Palau signed but didn't ratify the convention. The parties of the convention agreed to take appropriate measures to ban import and export to and from, dumping, reduce and to ensure adequate treatment and disposal facilities of hazardous wastes within the Convention area. Vanuatu joined the convention in 2007.

Vanuatu is also a party in many conventions that are related to the sustainable management of its environment with proper management of all kinds of chemicals. They include, London Convention (Prevention of Marine Pollution by Dumping of Wastes and Other Matter), Vienna Convention (Protection of Ozone Layer), Montreal Protocol (Ban on Substances that Deplete the Ozone Layer). Vanuatu is actively working in regard to the Vienna and Montreal commitments over the years. In line with these efforts to control Ozone depletion, Vanuatu developed its Ozone Layer Protection Act 2010 and as per the act, "National Ozone Advisory Committee" was established. The act is aimed at the progress of phasing out the usage of depleting substances except for the essential use and importation restrictions controlled substances.

The United Nations recognizes that, by joining forces of Basel, Rotterdam and Stockholm Conventions, ensure that hazardous chemicals are managed within a life-cycle approach, thereby ensuring that chemicals are managed in the most environmentally sound manner from cradle to grave, and in doing so ensures that, "that no one is left behind". Vanuatu's commitment in this regard is well appreciated as it is party to many of the international conventions and protocols.

5.2.5 National Implementation Plan

Vanuatu being a party of Stockholm Convention on Persistent Organic Pollutants (POPs) has been implementing "National Implementation Plan 2011" (NIP). The 2011 suggested many actions as part of NIP implementation. Among these some of the important actions recommended are,

- To prepare by 2013, a comprehensive chemical inventory for Vanuatu and set up an effective registry system for monitoring of imports (from entry to disposal); includes capacity building for Customs agency in IT and chemistry.

- To establish by the end 2013, standard chemical storage facility at port of entry for refused consignments and outgoing stockpiles shipments; integrated standard storage facilities for relevant institutions (users); a national laboratory with analytical capability to support enforcements on illegal imports and environment monitoring.

- To develop by the end of 2013, specialized human resources in the relevant field through formal training (scholarships); capacity of relevant agencies (Customs officers, OHS Officers, Agriculture Department Officers, DEPC Officers, and Quarantine Officers) through in-house trainings on handling, storage, disposal and use of chemicals; instructions (translated in Bislama, French and/or English) on handling, storage, disposal and method of applications for users by the supplier at point of purchase.

- Establish National Chemical Laboratory, including testing services for chemical imports and chemical poisoning.

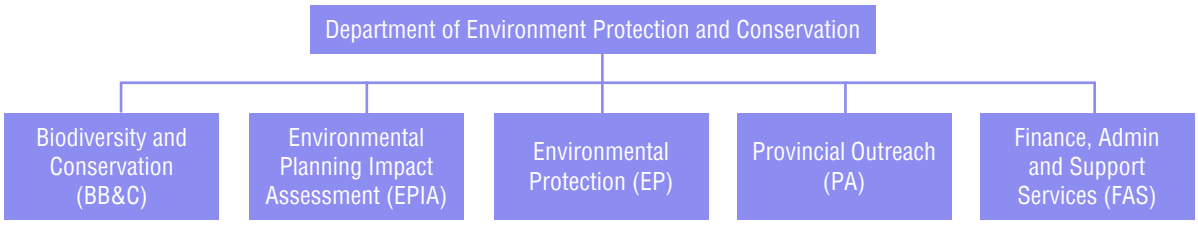
- Training programmes for the safe management of obsolete and unwanted chemicals.

- Training programmes in safe storage, handling and use of hazardous chemicals.

It is noted that most of the recommendations were not implemented due to various administrative and financial reasons. A review report of NIP is currently underway and it is hoped that more details will be brought forward.

5.3 DEPC's Institutional Infrastructure

DEPC is one of the four departments that work under Ministry of Climate Change Adaptation, Meteorology and Geo-Hazards, Environment, Energy and Disaster Management. In 2016 the Public Service Commission had approved the new updated structure in recognition of the increased roles and responsibilities (DEPC).
DEPC comprises of five divisions as follows:



Among DEPC's five divisions, EPIA and EP are directly related to the operations of chemical monitoring and assessment studies. In-specific, EP unit is more specifically involved in the chemical related assessments and international convention implementation activities. It is stated that EA is "responsible for implementing the Ozone Layer Protection Act, the Pollution Control Act, the Waste Management Act and the Vanuatu National Waste Management, Pollution Control Strategy and Implementation Plan 2016 – 2020".

It is noted that the units that cover chemical and pollution assessments is "under capacity" and "non-expertise" staffing in many roles. This has been the main reason for the department to depend on consultants from time to time to suffice their various project needs. Further the non-availability of staff had often led the department to attend late for many important submissions for receiving funds from international agencies or donors to take up new studies or capacity building initiatives. It was discussed that the over burden of work sometimes with various projects going on along with normal departmental roles needed more staff assistance to better perform for best outcomes. Thus consultant strongly recommends "**recruitment of staff**" should be considered an immediate priority to cater work load.

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Chapter 6

Conclusions and Recommendations

Conclusions and Recommendations

This chapter encapsulates all the observations being made during the course of consultations with all the stakeholders along with the current acts and polices being reviewed. This also include few recommendations based on the observations for appropriate action to be taken for the sound management of chemicals in Vanuatu.

6.1 Consultation Observations

As part of the consultations with stakeholders and visits to companies, dumpsites, schools etc., there are several observations being noted. They include,

- Vanuatu is an importer of chemicals but not a manufacturer.
- Some companies do import raw chemicals and formulate products for local sale.
- The imports include both hazardous and non-hazardous chemical products.
- Chemical entry by Customs Department does have many anomalies.
- In general, there is very limited understanding of protocols in regard of transport, storage, usage and disposal of chemicals. The state of affairs in the outer provinces other than Shefa province is even more alarming.
- Non-maintenance of records of chemical procurement, usage and disposal.
- Non-display of proper signage chemicals at work and storage places.
- Shortage of trained staff who handle chemicals at many work places.
- Lack of trainings/workshops from DEPC for stakeholders for awareness.
- Lack of DEPC staff to monitor chemical entry/storage/disposal.
- Lack of testing by DEPC for impact assessment for various chemical usage, storage and disposal sites.
- Laxity of coordination among various Government Departments to achieve sound chemical management.
- Irregular periodic inspections from DEPC for status of chemical usage, storage and stock maintenance records inspection.
- Non-cooperation from some stakeholders in site access and data submission for the consultancy work.

6.2 Recommendations

The consultant upon study and review of many previous consultancy/project/pilot studies (at DEPC and in general at other Departments/Ministries in Vanuatu) noted that "**Recommendations" were attended/implemented at a "low rate" or in some cases "not at all**".

Many a times it is an easy task to recommend many items to be attend or implement based on the ground level realities but with the track record, administrative and financial limitations, the consultant believe that it would be wise to have few and small targets. Keeping this reality in view, very limited and practical recommendations were suggested to "**implement without fail**" for the sound management of chemicals in Vanuatu for a healthy environment of all living and non-living.

Recommendation 1: LEGISLATIONS

The consultant does believe that the current Environmental Protection Act and Waste Management Act covers a wide range of processes, offences and penalties for any violation that comes under the term

R 1.1: However, the consultant recommends having a systematic legal framework for establishing a process of issuing permits for import of bulk/medium chemicals in to the country. There should be a registration process of these companies/organizations with DEPC with a mandate of submission of "annual reports of import, usage and stock of chemicals". This will inculcate the chemical users to maintain proper records, which is currently not being practiced by many stakeholders.

R 1.2: Further it is also recommended to have proper protocols established for "transport and storage" of chemicals and "discharge" of chemical wastes into environment.

R 1.3: The discharge limits (concentrations) of various pollutants should be established and informed to the relevant stakeholders from time to time. A national standard methodology should be established in-line with international

standards in regard to "protocols for the safe disposal of expired/unused/waste chemicals". Currently there is none in the country that deals with this important aspect.

R 1.4: Currently studies of DEPC are under way for Hazardous chemicals and Persistent Organic Pollutants alongside with recent reports on Mercury and Waste Oil, DEPC needs to establish separate protocols to deal with these individually. This will clearly enlighten the stakeholders of the importance and impact of these and thus distinguish from non-hazardous and general chemicals products.

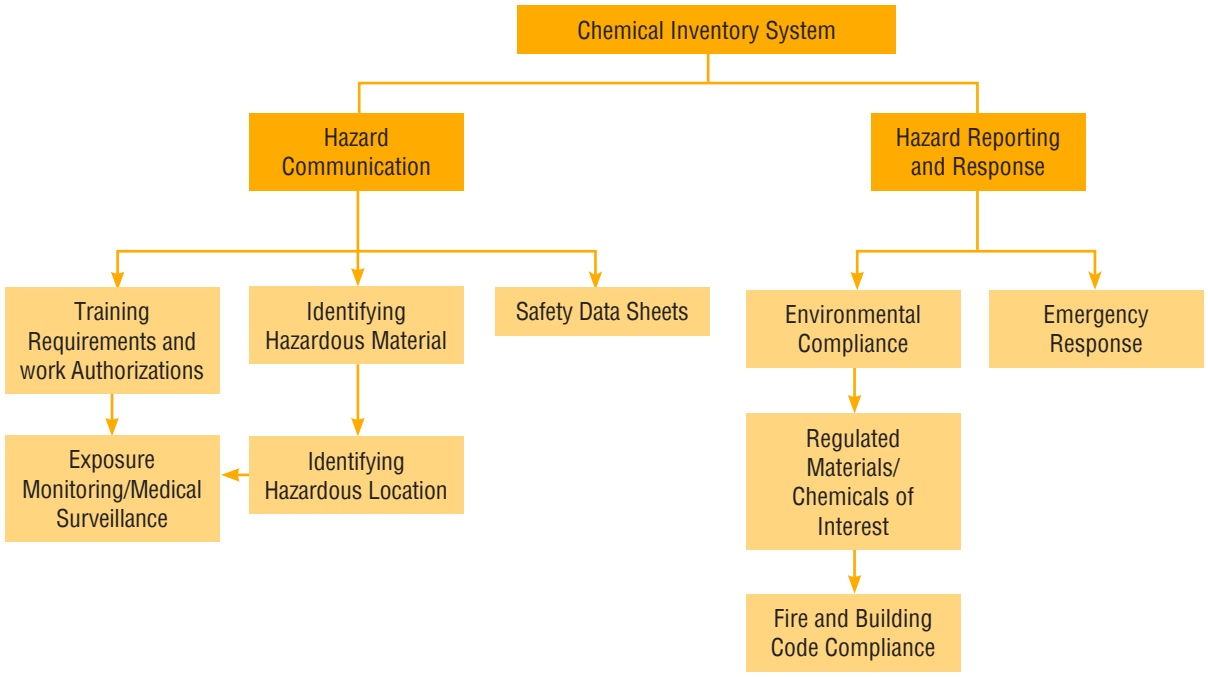
R 1.5: The crucial gap observed is lack of "Monitoring". As of "none monitoring" of work sites, companies etc., who are the "importers/users" of chemicals, it is a reality that there seems "no use" of having legislation/s. Yes, there might be an argument that, the legislations are useful "when needed" but the question of "when" would only arise if there is an "inspection" and "report" but not to be singled out to use when there is a chemical accident.

As many chemical pollution impacts are slow and unnoticed, regular monitoring is highly advocated and should be made mandatory and proper "legislation for monitoring time frame and reports should be established".

Recommendation 2: VANUATU NATIONAL CHEMICALS INVENTORY

R 2.1: The consultant strongly recommends establishing a "National Chemical Inventory" for a comprehensive list of chemicals of import and usage in the country. The database based on periodic/annual records in collaboration with Customs and stakeholders will certainly showcase the usage and storage of chemicals wherefrom appropriate actions can be taken for their monitoring and disposal. This database should also include visits, testing results, awareness programs etc.

R 2.2: The following model form the University of Princeton may be recommended for "Safe management of chemicals". This model can be applied to have a comprehensive system to track data and to respond for appropriate emergencies where/when needed for Government Departments and Stakeholders.



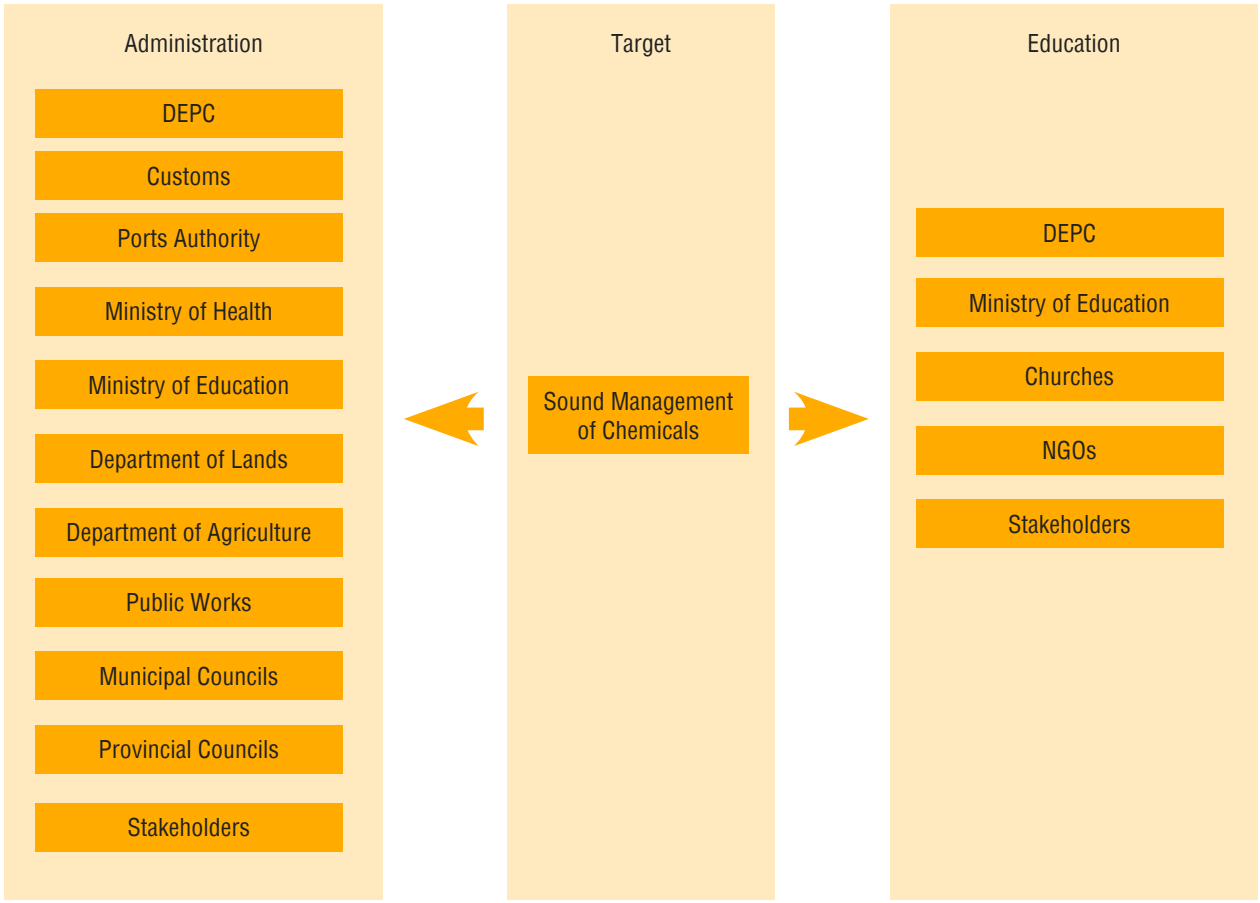
Recommendation 3: DEPC CAPACITY

The consultant believes that to achieve the above legislation in spirit and for the sound management of chemicals, there is an urgent need for capacity in form of "**Chemicals Monitoring Officer**". The creation of this position would in-line with "DEPC's Strategic Plan 2014-2024".

The role of the "Chemicals Monitoring Officer" should be as follows:

- Coordinate with Customs and Inland Revenue Department (CIRD) to seek data of chemical imports. A tri-monthly exercise seems good enough to take note and manage data.
- Regularly visit companies, work sites, farms etc. where bulk quantities of chemicals being imported. Inspect record maintenance, usage record, storage facility and discharge facilities of wastes.
- Regularly collect air, water and soil samples at various sites and test for the concentration of various pollutants. This task can be facilitated with another staff support (Lab Technician).
- Develop and maintain a comprehensive "**National Chemical Data**".
- Organize awareness campaigns for safe usage and storage of chemicals at work place. In line with established standards, this advocacy activities should include promotional works like workshops, trainings, awareness through social media, community meetings etc.

The working of the "Chemicals Monitoring Officer" may be aligned as follows:



Recommendation 4: NATIONAL CHEMICAL TESTING LABORATORY

The consultant recommends establishing "National Chemical Testing Laboratory" (NCTL). This laboratory would be handled by the "Chemical Monitoring Officer" with other support staff to constantly take samples of air, water (ground/marine) and soil to test the status. These sample sites should include surroundings of work / company sites using chemicals, discharge outlets, lagoons, seafront, freshwater resources, road sides, agricultural farms etc.

The consultant feels that NCTL can be started with an expansion/coordination of current "Vanuatu Bureau of Standards" or "Department of Water Resources" laboratories.

Recommendation 5: MONITORING OF STANDARDS OF IMPORT PRODUCTS

During the consultations, numerous concerns were raised in regard to imports that are of low quality, non-standard specifications in labeling (no proper details) etc. These include paints, engine oils, cosmetics and food products. It was mainly reported that these low quality products from some countries being imported as of their low cost compared to standard products.

A recent hair color product incident is a classic example of these kind of products. The women who used the hair color suffered with swollen eyes and skin rashes. It was reported that the chemical, paraphenylene diamine used in the product do cause these type of side effects. Vanuatu Bureau of Standards tested the product and reported that there are no details of chemicals used in the product (VBS / Dailypost).

Fig. 6.1 Swollen eyes due to a faulty hair color product (Courtesy: Dailypost)

The consultant recommends to monitor the import of products to establish their quality and standard information of composition. This could be achieved with close working of Vanuatu Bureau of Standards.

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