



**The Republic of the Union of Myanmar**

**National Implementation Plan of Myanmar for  
the Stockholm Convention on Persistent Organic Pollutants**

**December 2020**

## Foreword

In the world today, chemicals are part of everyday life and make the lives of millions of people around the world more productive and comfortable. There are more than a hundred thousand chemicals produced for commercial purposes. Amongst these chemical and some are unintentionally produced as by-products from industrial, manufacturing and combustion processes. Over the past decades, we have seen the use of chemicals and pesticides in industrial and agriculture sectors increasing dramatically. Amongst all chemicals released to the environment by human activity, Persistent Organic Pollutants (POPs) are one of the most problematic and hazardous. POPs cause a variety of adverse health effects, including cancer and increase the risk of chronic diseases, such as hypertension, cardiovascular disease, and diabetes. Managing of those toxic chemicals and wastes is a big challenge in all countries. Toxic chemical emission in the atmosphere, the pollution of the water and contamination of the land are happening due to the lack of proper management and safe disposal of chemicals not only in Myanmar but also all over the world.

At this important juncture, the world has come together many times, to warn about the imminent threats we are facing, and to find solutions. Myanmar, being a developing country, is striving to develop every means within our capacity, but we still need to overcome many daunting challenges. As the world gathers to find ways, it needs to overcome those challenges as a global citizen. Myanmar has participated in all those efforts, as well as attending most of the conventions and signed many of them. In a very short time, we restructured our institutions to better equip them to carry-out our obligations regarding International Conventions.

Myanmar has become a party to the Stockholm Convention on Persistent Organic Pollutants (POPs) on 19 April 2004. POPs are a threat to the environment and human health all over the world. As a member country, Myanmar is responsible for restriction on production, distribution, imports, exports and usage of POPs and finally the elimination of POPs according to the guidelines of Stockholm Convention and the National Implementation Plan (NIP) that has been developed as required by the Stockholm Convention.

Finally, I like to tender my gratitude to the Global Environment Facility (GEF), the United Nations Industrial Development Organization (UNIDO) and all concerned stakeholders. Without their support, the National Implementation Plan (NIP) would not be accomplished comprehensively. From the Governmental authorities to the general public, there has been strong enthusiasm and support for measures to protect the environment and control pollution. I encourage all the relevant stakeholders to continue the cooperation to implement the action plans stated in this National Implementation Plan of Myanmar for keeping a clean environment and achieving the

goals of the Myanmar Sustainable Development Plan (MSDP) towards Sustainable Development Goals (SDGs).

Ohnn Win  
Union Minister  
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The Government of the Republic of the Union of Myanmar

## Acknowledgement

Myanmar is a party to the Stockholm Convention on Persistent Organic Pollutants (POPs). Being conscious of the need to take measures to prevent the adverse effects caused by Persistent Organic Pollutants at all stages of their life cycle, and reaffirming the Principle 16 of the Rio Declaration on Environment and Development, that national authorities should endeavor to develop regulatory and assessment schemes for pesticides and industrial chemicals, and determined to protect human health and the environment from the harmful impacts of Persistent Organic Pollutants, the Environmental Conservation Department, of the Ministry of Natural Resources and Environmental Conservation, has now undertaken the task of formulating the Myanmar National Implementation Plan (NIP) to the Stockholm Convention.

Considerable efforts have been made to establish a comprehensive plan, taking into account all the factors that should be included in the National Plan. It is structured to include all aspects in a holistic manner, but it must be realistic and practical. To achieve this outcome, many steps have been taken, starting from getting the necessary mandate to implement the project from the Government, and getting approval from the National Environmental Conservation and Climate Change Central Committee (NECCCCC). This NIP will provide as a guidance roadmap for protecting human health and the environment from POPs.

The success of formulating the National Implementation Plan cannot be attributed to any individual, or a group of individuals, or even a department. It is a collective effort of many individuals and related departments and ministries, the Global Environment Facility (GEF), the United Nations Industrial Development Organization (UNIDO) and the Development Partners, INGOs and NGOs, Local Authorities, Civil Societies, Stakeholders and the public. Without their cumulative efforts, financially and technically, this project would not be implemented so successfully. Recognizing the collaborative efforts, Environmental Conservation Department will always be indebted to all those who were involved in each and every way. My thanks also go to all the officers and staff of the Environmental Conservation Department. I would not have been able to achieve anything to this level without them. Thank you all.

Hla Maung Thein  
Director General  
Environmental Conservation Department  
Ministry of Natural Resources and Environmental  
Conservation

## **Acknowledgement**

With the objective of promoting inclusive and sustainable industrial development (ISID), to harness the full potential of the industry's contribution to the achievement of sustainable development, and for the lasting prosperity for all, UNIDO is the specialized agency of the United Nations, which promotes the industrial development for poverty reduction, inclusive globalization and environmental sustainability. On the other hand, UNIDO has long recognized the important of chemicals managements as part of the mandate in SDG-9 which calls to “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”, realizing that Industrial Development could only be obtained environmental sustainability and social equity also comes in the picture.

UNIDO started operations in Myanmar in the late 1960s and UNIDO portfolio has been growing since 2010. This Persistent Organic Pollutants enabling activities project is a first project with UNIDO and Environmental Conservation Department. We have accomplished a millstone between the UNIDO and the Environmental Conservation Department, by overcoming many of the difficulties and barriers encountered during the implementation of this project.

As Myanmar embarked on formulating the National Implementation Plan as part of the obligation to the Stockholm Convention on Persistent Organic Pollutants, it is affirming its commitment to the global community to protect human health and the environment from the dangers of the harmful chemicals.

UNIDO is proud of the accomplishments of the National Implementation Plan of Myanmar on Stockholm Convention and we are also thankful to Ministry of Natural Resources and Environmental Conservation and Environmental Conservation Department for their full cooperation and also for the excellent coordination by the all related representatives from the Ministries, Departments and the private and public stakeholders in Myanmar.

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## Table of Contents

<b>FOREWORD.....</b>	<b>I</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>III</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>IV</b>
<b>TABLE OF CONTENTS .....</b>	<b>V</b>
<b>LIST OF TABLE .....</b>	<b>XII</b>
<b>LIST OF FIGURE .....</b>	<b>XIV</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>XV</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>CHAPTER I .....</b>	<b>9</b>
<b>1 INTRODUCTION.....</b>	<b>9</b>
1.1 Stockholm Convention .....	9
1.2 Provisions of the Stockholm Convention .....	9
1.3 National implementation plan.....	14
1.4 NIP development methodology .....	15
1.5 Structure of national implementation plan .....	16
1.6 Further considerations .....	16
1.6.1 Socio-economic assessment .....	16
1.6.2 Gender policy in NIP development and implementation.....	19
<b>CHAPTER II.....</b>	<b>21</b>
<b>2 COUNTRY BASELINE.....</b>	<b>21</b>
2.1 Country profile .....	21
2.1.1 Geography .....	21
2.1.1.1 Location.....	21
2.1.1.2 Major mountains and rivers.....	21
2.1.1.3 Weather and climate of Myanmar .....	22
2.1.2 Demography .....	22
2.1.2.1 Population density in states and regions.....	22
2.1.2.2 Population growth rates in rural and urban areas .....	23
2.1.3 Political profile .....	23
2.1.3.1 States and regions.....	23
2.1.3.2 Form of government.....	23
2.1.4 Economic profile .....	23
2.1.4.1 Agriculture .....	24
2.1.4.2 Fishery .....	24
2.1.4.3 Manufacturing .....	24
2.1.4.4 Energy .....	25
2.1.4.5 Mining .....	26
2.1.4.6 Construction .....	27
2.1.4.7 Hotel and tourism .....	28

2.1.4.8	IT and telecommunications .....	29
2.1.4.9	Wholesale and retail trade .....	29
2.1.4.10	GDP of Myanmar .....	29
2.1.5	Environmental overview.....	30
2.1.5.1	Current environment quality in the country .....	30
2.1.5.1.1	Water quality of the country .....	31
2.1.5.1.2	Air quality of the country .....	32
2.1.5.1.3	Soil quality of the country .....	34
2.1.5.2	Main environmental problems.....	35
2.1.5.3	Institutional infrastructures in the country .....	37
2.1.5.3.1	Infrastructures of environmental conservation in Myanmar	37
2.1.5.3.2	Infrastructure of waste management in Myanmar .....	39
2.1.5.3.3	Infrastructure of chemical management in Myanmar .....	41
2.1.6	Health overview.....	41
2.1.6.1	Major environmental health risks.....	42
2.1.6.2	Hospital and population ratio .....	42
2.1.6.3	Current conditions of health care programs .....	42
2.1.6.3.1	Tobacco control program.....	42
2.1.6.3.2	Tuberculosis control program.....	43
2.1.6.4	Medical and health facilities.....	43
2.1.6.4.1	Government facilities.....	43
2.1.6.4.2	Licensed private facilities .....	43
2.2	Institutional, policy and regulatory framework .....	44
2.2.1	The present general legislative processes framework of Myanmar.....	44
2.2.2	Profile of the union government and region or state governments.....	47
2.2.3	Environmental policy and legislative overview for POPs chemical and pesticide management including enforcement and monitoring requirements .....	48
2.2.3.1	National Environmental Policy of Myanmar .....	48
2.2.3.2	The Environmental Conservation Law.....	49
2.2.3.3	The Environmental Conservation Rules.....	50
2.2.3.4	Environmental Impact Assessment Procedure .....	51
2.2.3.5	National Environmental Quality (Emission) Guidelines.....	51
2.2.3.6	The Prevention of Hazard from Chemicals and Related Substances Law ...	52
2.2.3.7	The Prevention of Hazard from Chemicals and Related Substances Rules....	52
2.2.3.8	The Pesticide Law .....	55
2.2.3.9	The Plant Pest Quarantine Law .....	55
2.2.4	Relevant international commitments and obligations.....	56
2.3	Assessment of POPs issues in the country .....	57
2.3.1	Assessment of POPs pesticides (Annex A of SC Text, Part I).....	58
2.3.1.1	General .....	58
2.3.1.2	Legislation.....	59
2.3.1.3	Production .....	60
2.3.1.4	Import .....	62
2.3.1.5	Export.....	64
2.3.1.6	Registration .....	64
2.3.1.7	Release .....	66
2.3.1.8	Use.....	66

2.3.1.9	Future use of POPs pesticides .....	67
2.3.1.10	Storage.....	67
2.3.1.11	Disposal of POPs pesticides .....	68
2.3.1.12	Potential impacts of POPs pesticides .....	68
2.3.2	Assessment of PCBs (Annex A of SC Text, Part II) and PCNs (Annex A of SC Text, Part I).....	71
2.3.2.1	General .....	71
2.3.2.2	Import.....	72
2.3.2.3	Export.....	72
2.3.2.4	Use of transformers and other equipment .....	72
2.3.2.5	Registration and control .....	75
2.3.2.6	Storage and release.....	75
2.3.2.7	Potential impacts .....	75
2.3.3	Assessment of PBDEs (Annex A of SC Text, Part IV & Part V), HBB (Annex A of SC Text, Part I).....	75
2.3.3.1	General .....	75
2.3.3.2	EEE and WEEE containing POP-PBDEs .....	76
2.3.3.2.1	Import and export .....	77
2.3.3.2.2	Current use / storage .....	78
2.3.3.2.3	End-of-life.....	80
2.3.3.3	Transport sector.....	80
2.3.3.3.1	Import of vehicles .....	81
2.3.3.3.2	Vehicles in use.....	81
2.3.3.3.3	End-of-life.....	84
2.3.3.4	Potential impacts .....	84
2.3.4	Assessment of HBCD (Annex A of SC Text, Part I and Part VII).....	85
2.3.4.1	General .....	85
2.3.4.2	Production .....	85
2.3.4.3	Inventory of HBCD in polystyrene (EPS and XPS) in current use and stock .....	85
2.3.4.3.1	Inventory of HBCD in EPS/XPS producing factories .....	85
2.3.4.3.2	Other EPS / XPS products .....	90
2.3.4.3.3	High Impact Polystyrene (HIPS) in electronics.....	91
2.3.4.3.4	HBCD use in textiles .....	91
2.3.4.3.5	End of life management.....	92
2.3.4.4	Potential impacts .....	92
2.3.5	Assessment with respect to DDT (Annex B of SC Text, Part II) .....	92
2.3.5.1	General .....	92
2.3.5.2	Import.....	92
2.3.5.3	Export.....	93
2.3.5.4	Use.....	93
2.3.5.5	Release and storage .....	93
2.3.5.6	Potential impacts .....	94
2.3.6	Assessment of PFOS, its salts and PFOSF (Annex B of SC Text, Part III) .....	95
2.3.6.1	General .....	95
2.3.6.2	Production .....	95
2.3.6.3	Import of PFOS and related substances .....	95

2.3.6.4	Use and stocks of PFOS .....	96
2.3.6.4.1	Stock and use of PFOS in firefighting foam.....	96
2.3.6.4.2	Sulfluramide (several different names) insecticide for ants and termite .....	98
2.3.6.4.3	Aviation hydraulic fluid.....	98
2.3.6.4.4	Chromium plating and other plating.....	98
2.3.6.4.5	Carpets and other treated material .....	98
2.3.6.5	Potential impacts .....	98
2.3.7	Assessment of releases of unintentional produced chemicals (Annex C of SC Text)..	99
2.3.7.1	Background .....	99
2.3.7.2	Inventory of PCDD/Fs and other unintentionally-produced POPs .....	100
2.3.8	Information on the state of knowledge on contaminated sites and wastes, identification, likely numbers, remediation measures, and data on releases from sites .....	102
2.3.8.1	POPs pesticides contaminated sites.....	102
2.3.8.2	PCB contaminated sites.....	105
2.3.8.3	POP-PBDE, HBB and HBCD waste and contaminated sites and hotspots .....	105
2.3.8.4	PFOS contaminated sites and hotspots.....	105
2.3.8.5	PCDD/F and UPOPs contaminated sites and hotspots.....	106
2.3.8.5.1	Production sites of chlorine .....	106
2.3.8.5.2	Production sites of chlorinated organics .....	106
2.3.8.5.3	Application sites of PCDD/PCDF containing pesticides and chemicals .....	106
2.3.8.5.4	Timber manufacture and treatment sites.....	106
2.3.8.5.5	Textile and leather factories.....	106
2.3.8.5.6	Use of PCB .....	107
2.3.8.5.7	Waste incinerators .....	107
2.3.8.5.8	Metal industries .....	107
2.3.8.5.9	Dumps of wastes/residues from source groups 1-9 .....	107
2.3.9	Summary of future production, use, and releases of POPs – requirements for exemptions.....	107
2.3.9.1	Background .....	107
2.3.9.2	Production, use, import and export of POPs listed in Annex A and B of Stockholm Convention .....	108
2.3.9.2.1	Production of POPs listed in Annex A and B of SC Text .	108
2.3.9.2.2	Use of Annex A and B POPs of SC Text .....	108
2.3.9.2.3	Import and export of Annex A and B POPs of SC Text....	108
2.3.10	Existing programmes for monitoring releases and environmental and human health impacts, including findings.....	108
2.3.11	Current level of information, awareness, and education among target groups; existing systems to communicate such information to the various groups.....	112
2.3.11.1	Overview of public information policy and practice related to environment.....	112
2.3.11.2	Specific practices by governments and stakeholders in ensuring public awareness and involvement activities .....	112

2.3.11.2.1	Ministry of Natural Resources and Environmental Conservation .....	112
2.3.11.2.2	Ministry of Information .....	113
2.3.11.2.3	Ministry of Agriculture, Livestock and Irrigation .....	114
2.3.11.2.4	Ministry of Planning, Finance and Industry .....	114
2.3.11.2.5	Ministry of Electricity and Energy .....	114
2.3.11.2.6	Ministry of Commerce.....	115
2.3.11.2.7	Ministry of Health and Sports.....	115
2.3.11.2.8	Ministry of Education .....	116
2.3.11.2.9	Yangon City Development Committee.....	116
2.3.11.2.10	Union of Myanmar Federation of Chambers of Commerce and Industry .....	116
2.3.11.2.11	Agriculture, Market and Information Agency .....	117
2.3.11.2.12	Consumer Protection Association of Myanmar .....	117
2.3.11.3	Collaboration among the Governments and Stakeholders .....	118
2.3.11.4	Present public information tools, techniques and mechanisms for disseminating environment related information (brochures, fact sheets, media coverage, environmental publications, internet).....	118
2.3.11.4.1	Requirements for public consultation related to Environmental Impact Assessment (EIA) .....	119
2.3.11.4.2	Assessment of environment as public priority and effectiveness of information pathways, programs, practices, and tools.....	120
2.3.12	Mechanism to report under Article 15 on measures taken to implement the provisions of the convention and for information exchange with other parties to the convention .....	121
2.3.12.1	Background .....	121
2.3.12.2	Country reporting .....	121
2.3.13	Information exchange mechanism.....	122
2.3.13.1	Background .....	122
2.3.13.2	Information exchange with other parties to the convention .....	123
2.3.14	Relevant activities of non-governmental stakeholders .....	123
2.3.15	Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, research and development – linkage to international programmes and projects.....	124
2.3.16	Overview of technical infrastructure for POPs management and destruction .....	126
2.3.16.1	Waste management including POPs management and destruction.....	126
2.3.16.2	Capacity and infrastructure for contaminated sites assessment, securing and remediation .....	127
2.3.17	Identification of impacted populations or environments .....	127
2.3.18	Details of any relevant system for the assessment and listing of new chemicals ..	129
2.3.19	Details of any relevant system for the assessment and regulation of chemicals already in the market .....	132
2.4	Implementation status.....	133

<b>CHAPTER III</b> .....	<b>136</b>
<b>3 STRATEGY AND ACTION PLANS</b> .....	<b>136</b>
3.1 Policy statement.....	136
3.1.1 Government’s commitment to address the POPs issue .....	136
3.1.2 Endorsement of NIP .....	137
3.2 Implementation strategy .....	137
3.2.1 Coordination with national plans and inter-ministerial and stakeholder coordination .....	137
3.2.2 Adequate legal, institutional, administrative and technical infrastructure.....	140
3.2.3 Synergies among related Multilateral Environmental Agreements (MEAs).....	141
3.2.4 Addressing POPs substitution and clean material cycles within sustainable consumption and production (SDG12) implementation.....	142
3.2.5 Gender policy in NIP development and implementation.....	143
3.3 Action plans, including respective activities and strategies .....	144
3.3.1 Institutional and regulatory strengthening measures .....	144
3.3.2 Production, import and export, use, stockpiles, and waste of Annex A POPs pesticides of SC Text (Annex A, Part I Chemicals of SC Text).....	152
3.3.3 Import and export, use, identification, labelling, storage, and disposal of PCBs and equipment containing PCBs (Annex A, Part II Chemicals of SC Text).....	157
3.3.4 Import and export, use, stockpiles, and wastes of POP- PBDEs (Annex A, Part IV & V Chemicals of SC Text), HBCD and HBB (Annex A, Part I Chemical of SC Text) .....	165
3.3.5 Import and export, use, stockpiles and wastes of DDT (Annex B Chemicals of SC Text) if used in the country.....	172
3.3.6 Import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSF (Annex B, Part III Chemicals of SC Text) .....	174
3.3.7 Register for specific exemptions and the continuing need for exemptions (Article 4).....	178
3.3.8 Measures to reduce or eliminate releases from unintentional production (Article 5) .....	180
3.3.8.1 BAT/BEP (Best Available Technique and Best Environmental Practice).....	180
3.3.8.2 Waste management .....	181
3.3.8.3 Synergies in inventory making.....	181
3.3.9 Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6).....	187
3.3.10 Identification of contaminated sites (Annex A, B, and C Chemicals of SC Text) and securing and remediation in an environmentally sound manner .....	190
3.3.11 Facilitating information exchange and stakeholder participation.....	197
3.3.12 Public information, awareness and education (Article 10).....	199
3.3.13 Effectiveness evaluation (Article 16) .....	202
3.3.14 Reporting (Article 15) .....	204
3.3.15 Research, development and monitoring (Article 11).....	206
3.3.16 Technical and financial assistance (Articles 12 and 13).....	210
<b>CHAPTER IV</b> .....	<b>212</b>
<b>4 PRIORITIES AND CAPACITY-BUILDING NEEDS AND PROPOSALS</b> .....	<b>212</b>
4.1 Priority areas and capacity building needs .....	212

4.1.1	Strengthening the coordination between institutions and stakeholders and development of capacity and knowledge in the relevant committees .....	212
4.1.2	Development of legislation and related implementation .....	213
4.1.3	Capacity building, research, education, information and awareness raising .....	213
4.1.4	Environmentally sound management of POPs stockpiles (PCBs, pesticides; POP-PBDEs, HBCD and PFOS).....	214
4.1.5	Improvement of waste management and introduction of waste hierarchy towards (more) circular economy and reduction of unintentionally formed POPs from open burning.....	216
4.1.6	BAT/BEP for dioxin/UPOPs reduction and integrated pollutant prevention and control.....	217
4.1.7	Monitoring of POPs, effectiveness evaluation and collaboration.....	218
4.1.8	Substitution of POPs and selection of green/sustainable alternatives to promote circular economy .....	218
4.1.9	Contaminated site assessment and management .....	219
4.2	Time frame for the implementation strategy and action plans .....	220
4.3	Resource requirements .....	222

## List of Table

Table 1.	List of POPs in Annex A, B and C of the Stockholm Convention .....	11
Table 2.	Acceptable purposes and/or specific exemptions for POPs listed in the SC .....	12
Table 3.	List of open dumping sites capacity in Yangon.....	39
Table 4.	International conventions or regional agreements on environment which are ractedified by Myanmar.....	56
Table 5.	List of banned pesticides in Myanmar (by notification no: 06/2018 of Pesticide Registration Board, 9th Aug 2018).....	59
Table 6.	List of restricted pesticides (by notification no: 5/2015 of Pesticide Registration Board, 9 <sup>th</sup> Aug 2018) .....	60
Table 7.	Production of endosulfan 35EC in pilot pesticide formulation plant, HmawBi .....	61
Table 8.	Pesticide formulation in Hmawbi pesticide formulation plant .....	61
Table 9.	Neem pesticide production in Myanmar.....	62
Table 10.	Import of endosulfan 35 EC from 1995 to 2008.....	64
Table 11.	Former utilization of POPs pesticides in agricultural sector.....	67
Table 12.	Distribution of the acute pesticide poisoning cases by type in 2003 .....	68
Table 13.	Distribution of the acute organophosphorus pesticide poisoning cases by category in 2003.....	69
Table 14.	Residues survey in food commodities and violation of MRL's (1989 - 2005) .....	69
Table 15.	Environmental samples analyzed and level of pesticides detected (in PPM) .....	70
Table 16.	Summary of PCB inventory in Myanmar .....	74
Table 17.	Estimated amount of PBDEs and polymers in imported PCs.....	77
Table 18.	Initial screening of bromine, lead, cadmium, chromium and arsenic in selected electronics .....	79
Table 19.	Registered motor vehicle in Myanmar from 2010 to 2018.....	83
Table 20.	List of imported amount of material which contain EPS & XPS in Myanmar (2010- 2016) .....	86
Table 21.	List of expandable polystyrene (EPS) used in factory (concentration of HBCD: estimated 0.7%) .....	87
Table 22.	List of extruded polystyrene (XPS) used in factory.....	89
Table 23.	List of alternative raw material used instead of EPS in factory.....	89
Table 24.	Summary data of initial screening of HBCD in EPS / XPS with handheld XRF equipment.....	91
Table 25.	Amount of DDT used in indoor residual spray in states and regions from (2006 – 2015).....	93
Table 26.	Amount of DDT remaining in state/region.....	94
Table 27.	Utilization and stock of firefighting foam in 2016 .....	96
Table 28.	Fire- fighting foam used from 2015 to 2018.....	97
Table 29.	PCDD/F release in Myanmar for the baseline inventory 2016.....	102
Table 30.	Residues analysis results of soil sample from three villages .....	104
Table 31.	Past medical history of potentially POPs exposed people (2017).....	109
Table 32.	Past medical history of family members.....	110
Table 33.	Current information dissemination tools, techniques, mechanisms used by the relevant stakeholders.....	118
Table 34.	Implementation status .....	133
Table 35.	Action plan for institutional and regulatory strengthening measures .....	146
Table 36.	Action plan for importing and exporting, usage, stockpiles, and wastes of POPs pesticides (Annex A of SC Text) and highly hazardous pesticides (HHPs; SAICM synergy).....	153

Table 37.	Action Plan for importing and exporting, usage, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II Chemicals of SC Text).....	159
Table 38.	Action plan for importing and exporting, usage, stockpiles and waste of POP-PBDEs (Annex A, Part IV & V chemicals of SC Text), HBCD and HBB (Annex A, Part I Chemical of SC Text).....	166
Table 39.	Action plan for importing and exporting, usage, stockpiles and wastes of DDT (Annex B Chemical of SC Text).....	173
Table 40.	Action plan for importing and exporting, usage, stockpiles and wastes of PFOS, its salts and PFOSF (Annex B Part III Chemicals of SC Text) (SAICM Synergy).....	175
Table 41.	Action plan for registration for specific exemptions and continuing need for exemptions (Article 4) .....	179
Table 42.	Action plan for reduction and elimination of releases from unintentional production (Dioxins/UPOPs) (Article 5) .....	182
Table 43.	Action plan for reduction and elimination of releases from stockpiles and wastes (Article 6).....	188
Table 44.	Action plan for identification of contaminated sites (Annex A, B and C Chemicals of SC Text) and securing and remediation in an environmentally sound manner.....	191
Table 45.	Action plan for facilitating information exchange and stakeholder participation.....	198
Table 46.	Action plan for public information, awareness and education (Article 10).....	200
Table 47.	Action plan for effectiveness evaluation (Article 16).....	203
Table 48.	Action plan for reporting (Article 15) .....	205
Table 49.	Action plan for research, development and monitoring (Article 11) .....	207
Table 50.	Action plan for technical and financial assistance (Articles 12 and 13).....	211
Table 51.	Time frame for implementation strategy and action plans .....	221
Table 52.	Estimated budget for priority activities for POPs management in Myanmar .....	225

## List of Figure

Figure 1.	Energy situation in Myanmar.....	26
Figure 2.	Mineral belts of Myanmar .....	27
Figure 3.	Myanmar construction industry annual output .....	28
Figure 4.	Myanmar tourism graph from 2008 until 2017.....	28
Figure 5.	Myanmar GDP.....	30
Figure 6.	PM 2.5 levels in 2016 .....	33
Figure 7.	Percentage of distribution of different soils in Myanmar .....	34
Figure 8.	Solid waste management framework .....	41
Figure 9.	Import of pesticides from 2005 to 2015.....	63
Figure 10.	Import of pesticides from 2015 to 2017.....	63
Figure 11.	Current storage condition of DDT stockpiles in Myanmar management of POPs pesticides.....	68
Figure 12.	PCB inventory activities .....	73
Figure 13.	Imported TVs, computers and printers 2010 to 2016 (Data Ministry of Commerce).....	77
Figure 14.	Share of large household appliances (category 1) in a survey of 79 households.....	79
Figure 15.	Registered motor vehicle in Myanmar from 2010 to 2018.....	84
Figure 16.	HBCD inventory activities.....	86
Figure 17.	UPOPs inventory activities.....	100
Figure 18.	Inventory of POPs pesticides contaminated sites .....	103
Figure 19.	Location of sample collecting positions in Magwe region .....	104
Figure 20.	Evaluation process for the pesticide registration .....	133

## List of Abbreviations

ADB	Asia Development Bank
BAT	Best Available Techniques
BC	Basel Convention
BEP	Best Environmental Practices
BFRs	Brominated Flame Retardants
BOD	Biological Oxygen Demand
CDCs	City Development Committees
COPs	Conference of the Parties
CRT	Cathode Ray Tube
ECD	Environmental Conservation Department
EEE	Electrical and Electronic Equipment
EIA	Environmental Impact Assessment
ELV	End of Life Vehicle
EPR	Extended Producer Responsibility
EPS	Expanded Polystyrene
ESM	Environmentally Sound Management
EU	European Union
E-waste	Electronic waste
FAO	Food and Agriculture Organization
GC-MS	Gas Chromatography - Mass Spectrometry
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gases
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GLP	Good Laboratory Practice
GMP	Global Monitoring Plan
GoM	Government of Myanmar
HBB	Hexabromobiphenyl
HBCD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HCBD	Hexachlorobutadiene
HHPs	Highly Hazardous Pesticides
HIPS	High Impact Polystyrene
ILO	International Labor Organization
IPCS	International Programme on Chemical Safety

IPM	Integrated Pest Management
IPPC	Integrated Pollution Prevention and Control
LCD	Liquid-Crystal Display
LDCs	Least Developed Countries
MCDC	Mandalay City Development Committee
MEAs	Multilateral Environmental Agreements
MFA	Material Flow Analysis
MIA	Myanmar Industry Association
MNCC	Multi-stakeholder National Coordination Committee
MOALI	Ministry of Agriculture, Livestock and Irrigation
MOCe	Ministry of Commerce
MOCn	Ministry of Construction
MOECAF	Ministry of Environmental Conservation and Forestry
MOGE	Myanmar Oil and Gas Enterprise
MOEE	Ministry of Electric and Energy
MOE	Ministry of Education
MOHA	Ministry of Home Affairs
MOHS	Ministry of Health and Sports
MOTC	Ministry of Transport and Communications
MONREC	Ministry of Natural Resources and Environmental Conservation
MOPFI	Ministry of Planning Finance and Industry
MOI	Ministry of Industry
MOPF	Ministry of Planning and Finance
MSDP	The Myanmar Sustainable Development Plan
MT	Metric Ton
NAP	National Action Plan
NAPA	National Adaptation Programme of Action
NECCCC	National Environmental Conservation and Climate Change Central Committee
NGOs	Non-Governmental Organizations
NIP	National Implementation Plan
OCP	Organochlorine pesticides
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
PBDEs	Polybrominated diphenyl ethers
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofurans
PCCDs	Pollution Control and Cleansing Departments
PCNs	Polychlorinated naphthalene
PFHxS	Perfluorohexane sulfonate
PFOA	Perfluorooctanoic acid

PFOS	Perfluorooctane sulfonic acid
PFOSF	Perfluorooctane sulfonyl fluoride
POPs	Persistent Organic Pollutants
POPRC	POPs Review Committee
PPD	Plant Protection Directorate
PPP	Polluter Pay Principles
PPE	Personal Protective Equipment
ppm	parts per million
PRB	Pesticide Registration Board
PRTR	Pollutant Release and Transfer Register
PSMS	Pesticide Stockpile Management System
PUR	Polyurethane
PVC	Polyvinyl Chloride
SAICM	Strategic Approach to International Chemicals Management
SC	Stockholm Convention
SCCPs	Short Chain Chlorinated Paraffins
SCP	Sustainable Consumption and Production
SDG	Sustainable Development Goal
SEA	Socio-Economic Assessment
SFA	Substance Flow Analysis
SOP	Standard Operation Procedure
T	Ton
TDCs	Township Development Committees
TEQ	Toxic Equivalent
UNCCD	United Nations Convention on Combating Desertification
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UPOPs	Unintentionally Produced POPs
US EPA	United States Environment Protection Agency
UV	Ultraviolet
WEEE	Electric and Electronic Equipment Waste
WHO	World Health Organization
XRF	X-ray Fluorescence
XPS	Extruded Polystyrene
YCDC	Yangon City Development Committee

## Executive Summary

The Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) was adopted on 22 May 2001 in Stockholm, Sweden, and entered into force on 17 May 2004. The objective of the SC is the protection of human health and the environment from these hazardous substances. The SC imposes a worldwide ban or control on the production and trade of POPs pesticides and POPs used in industrial processes and consumer goods, and requires the reduction and minimization of the unintentional production and release of POPs formed as unintentional by-products in industrial and combustion processes.

Myanmar has become a party to the Stockholm Convention on POPs on 19 April 2004 and entered into force on 18 July 2004.

Article 7 of the SC requires each Party to develop, and endeavour to put into practice, a plan setting out how it will implement its obligations under the Convention. Therefore, Myanmar has developed its National Implementation Plan (NIP) to meet the country's obligations to the Stockholm Convention. The NIP is transmitted to the Conference of the Parties (COPs) through the Secretariat of the Convention.

The NIP describes how Myanmar will fulfill its obligations under the SC to eliminate or reduce POPs releases and carry out environmentally sound management of stockpiles of POPs containing wastes and contaminated sites that pose high risks to human health and the environment. The NIP supports Myanmar's policy objectives to integrate environmental considerations and pollution prevention into Myanmar Sustainable Development Plan (MSDP) to enhance the quality of life of all its citizens and secure a sustainable development of the industrial sector. The action plans described in the NIP should be mainstreamed into the related goals and strategies of the MSDP. The management of POPs will also be mainstreamed into the Myanmar National Hazardous Waste Management Master Plan in Myanmar.

The current NIP has addressed the POPs listed up to 2013 (COP6). The action plan in Chapter III also included initial activities to address the POPs listed in 2015 (COP7) and 2017 (COP8).

The goals of the NIP are:

- (1) To describe the actions that Myanmar has undertaken regarding the inventory, management and reduction of the presence of POPs;
- (2) To propose actions that Myanmar will undertake in order to manage and eliminate POPs, as well as for preventing these chemicals from entering the environment;

- (3) To inform the Conference of the Parties and Myanmar's stakeholders about the national initiatives and projects designed to meet the requirements of the SC.

The NIP comprises of four chapters:

- (1) Chapter I provides an overview of the aims and goals of the NIP, as well as the process for the development of the NIP;
- (2) Chapter II outlines Myanmar's demographic, political and economic status and it gives basic information on Myanmar's status regarding the management of POPs;
- (3) Chapter III presents an overview of recommended activities, strategies, and action plans;
- (4) Chapter IV presents priorities, capacity-building needs, time frame for implementation strategy and resource requirements.

During the NIP formulation, the situation of the POPs has been assessed and inventories have been developed. The following are the main assessments made:

- (1) **POPs pesticides:** POPs pesticides are not used in Myanmar anymore. All POPs pesticides are banned. The last know usage of endosulfan and dichlorodiphenyltrichloroethane (DDT) was more than 5 years ago. Some pesticides are illegally smuggled into the country and some counterfeit pesticides might be sold in the country using the legally allowed name and brand currently found in the market. Dichlorodiphenyltrichloroethane (DDT) stocks (total 23 t) are safely stored in several storage sites around the country with no evident release to the surrounding areas.
- (2) **Polychlorinated biphenyls (PCBs) and Polychlorinated naphthalenes (PCNs):** PCB-containing equipment and materials, such as transformers, capacitors, hydraulic oils, and possibly, PCB-containing materials for open applications (eq. paints, cables etc.) have been imported in the past until 2016. After the ban of PCBs, no import has been registered in Myanmar. A total of 592 transformers oil samples from 5 Regions, 3 States and Nay Pyi Taw, accounting for 1.3 % of the whole transformer network of Myanmar, were randomly collected in 2016 and 2017 by the PCB task team. The samples were analysed using L2000DX for chlorine content. The results indicated that 119 transformers out of the 592 transformers tested (1.3% of the 46,000 transformers) were estimated to be contaminated with PCB/chlorine (more than 50 ppm). From similar projects it is known that a considerable share of the positive chlorine tested samples between 50 to

200 ppm are false positive and do not contain PCB. Therefore it is estimated that the PCB stockpile in Myanmar is between 1,000 to 3,000 t of PCB contaminated oil and equipment.

- (3) **Polybrominated diphenyl ethers (PBDEs):** For electronics, the amount of cathode ray tube (CRTs) in Myanmar was estimated via a penetration rate of ca. 0.08 CRT/person. With a total population of 52.9 million (2016), the total amount of CRTs was estimated to be around 423,200 with a total weight of 10,580 tonnes of CRTs including 3174 tonnes of plastic. C-OctaBDE content of these CRTs is estimated in the range of 2761 - 8062 kg and the content of POP-PBDEs listed in 2009 is around 1491- 4354 kg. For the transport sector, the total polymer content in the 2016 registered 462,199 passenger cars were estimated to be approx. 92,440 t with a total PUR foam of 7395 t. Estimated amount of c-PentaBDEs contained in cars, trucks and buses are around 1849 kg, 1002 kg and 415 kg respectively. Therefore, the total amount of POP-PBDEs listed 2009 in the transport sector is estimated to be around 3265 kg. Overall this can be considered a lower estimate since DecaBDE was listed in 2017 in the Stockholm Convention as POPs and has not been considered in this inventory.
- (4) **Hexabromocyclododecane (HBCD):** For HBCD inventory, ten EPS production factories and two XPS production factories and eight factories producing alternative insulation/products instead of EPS, have been inspected and their production volumes were assessed. In 2016, total volume of EPS produced from ten factories and XPS produced from two factories were 888,400 kg and 334,800 kg respectively. For the EPS product volume with assumed 0.7% HBCD addition, among ten EPS production factories, two factories have been producing 35,000 kg and 16,290 kg of insulation foams with estimated HBCD use as 245 kg and 114 kg since 2011 and 2014, respectively. Other EPS/XPS products such as fish boxes or food packaging do not normally contain HBCD as confirmed by XRF screening. For other minor uses of HBCD (textiles and electronics) no quantitative assessment was made.
- (5) **Perfluorooctane sulfonic acid (PFOS):** The main stocks of PFOS and related substances are likely fire fighting foams. The total import of fire fighting foam in 2016 was 56,067 litres, out of which the Fire Service Department only used 1587 litres and the rest (54,480 litres) remaining in stock. Moreover, the import of alcohol-resistant foam was 9165 litres, which was not used within 2016 and can be found in stock. The total amount of fire fighting foams is likely considerably higher considering

imports from earlier years. It could not be clarified in this first inventory which share of these foams contains PFOS and which share contains PFOA or other PFAS. The highest amount of fire fighting foam use (3296 litres) was in Yangon region and the second highest in Ya Khine state (455 litres) while in other states and regions fire fighting foam use was <200 litres. Also synthetic carpets imported to Myanmar in particular before 2002 might contain PFOS. Other uses were not present in Myanmar (sulfloramide pesticide, aviation hydraulic fluid or chromium plating).

- (6) **Unintentionally-produced POPs (UPOPs):** The inventory of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD / Fs) was compiled for inventory year 2016. The total emission from inventoried sources were 854.1 g TEQ/a. The highest share of PCDD / PCDFs released stem from open burning with an estimated release of 417.4 g TEQ/a. (50.5% of total). The second most relevant source is waste incineration emitting 367.2 g TEQ/a. (43.0% of total). The main source here are hospital waste incinerator operating in batch mode with a release estimate of 366.8 g TEQ/a. The third largest source is ferrous & non-ferrous metal production with 14.6 g TEQ/a release (1.7% of total) and production of mineral products (cement industry) with a release of 7 g TEQ/a (0.8% of total). For chlorinated chemicals only the release from 2,4-D was assessed and estimated to be 2.9 g TEQ/a (0.3%). All other sources were below 0.1% of releases and are therefore, negligible.

An initial assessment of POPs-contaminated sites was conducted. For all POPs categories, contaminated sites likely exist in Myanmar. However, there is limited assessment and analytical capacity in the country. Initial measurements of POPs pesticides in a few areas indicated low contamination.

Laboratory capacity was assessed in the country and this revealed that only limited capacity to monitor POPs pesticides exist. This need is addressed in the action plan.

POPs management and destruction capacity were also evaluated. BAT/BEP cement kilns and a BAT/BEP waste incinerator are available in the country but need further assessment to gauge their suitability for POPs destruction.

An assessment scheme exists in the country for monitoring POPs pesticides. However, there is currently no particular assessment of industrial chemicals used in Myanmar.

Moreover, Policy Statement and strategies for NIP implementation are stated in Policy Statement and Implementation Strategy of Chapter III including:

- (1) Strengthening the coordination between institutions and stakeholders and development of capacity and knowledge in the relevant committees;
- (2) Legal, institutional, administrative and technical infrastructure;
- (3) Synergies among related Multilateral Environmental Agreements (MEAs);
- (4) Addressing POPs substitution and Clean Material Cycles within implementation of sustainable consumption and production (SDG12).

Action Plans, including respective activities and strategies of Chapter III in NIP outlines the action plans, including respective objectives, activities and strategies for POPs management in Myanmar for implementation and responsible implementing authorities and participating implementers and stakeholders. Individual action plans have been developed which can support the overall management of hazardous chemicals and POPs impacted waste fractions, support the development of BAT/BEP and boosting research in environmental monitoring, in recycling and industrial releases as well as contributing to:

- (1) Institutional and regulatory strengthening measures including development of legislation;
- (2) Measures to reduce or eliminate releases from intentional production and use of POPs pesticides and highly hazardous pesticides import and export, use, stockpiles/waste and disposal as well as implementation of Integrated Pest Management (IPM) and organic farming;
- (3) Inventory of PCBs storage, management, import and export, use, and disposal;
- (4) POP-BFRs; PBDEs, HBCD and HBB; regulation and life cycle management;
- (5) PFOS and related substances regulation and life cycle management, use, stockpiles, and wastes. To promote the synergy of the Stockholm Convention and SAICM, the action plan is extended where appropriate to other PFAS which are an issue of concern in SAICM;
- (6) Register for specific exemptions and the need for exemptions (Article 4);
- (7) Measures to reduce releases from unintentional production (PCDD/Fs and other UPOPs) including integrated pollution prevention and control;
- (8) Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6);
- (9) Identification of contaminated sites of Annex A, B, and C Chemicals of SC Text and, where feasible, remediation in an environmentally sound manner;
- (10) Facilitating or undertaking information exchange and stakeholder participation;

- (11) Public/stakeholder awareness, information awareness and education (Article 10);
- (12) Effectiveness evaluation (Article 16);
- (13) Reporting (Article 15);
- (14) Research, development and monitoring/analytical capacity (Article 11);
- (15) Technical and financial assistance (Article 12 and 13).

Priority activities and capacity building are compiled in Chapter IV. For the individual priorities, their link to Myanmar's Sustainable Development Plan and related goals and strategies are mentioned. The main priority action areas include:

- (1) Strengthening coordination between institutions and stakeholders and development of capacity and knowledge in the relevant working committees of the National Environmental Conservation and Climate Change Central Committee (NECCCCC);
- (2) Development of legislation and related implementation;
- (3) Education, information and awareness raising;
- (4) Management of POPs stockpiles (PCBs/PCNs, pesticides; POP-PBDEs, HBCD and PFOS);
- (5) Improvement of waste management and introduction of waste hierarchy for reduction of unintentionally formed POPs from open burning;
- (6) BAT/BEP for dioxin/UPOPs reduction and integrated pollutant prevention and control;
- (7) Monitoring of POPs, effectiveness evaluation and initiate research and collaborations;
- (8) Substitution of POPs in use and selection of green and sustainable alternatives;
- (9) Contaminated sites assessment and management.

In resource requirement of Chapter IV in NIP, strategies for financing of the NIP are shortly compiled. Financial resources needed for implementation of priority activities are roughly estimated.

The ability of the country to fulfil its obligations under the POPs Convention depends on adequate financial and technical assistance. Myanmar needs technical and financial assistance from international donors and will seek this assistance when implementing its NIP. By mainstreaming of the NIP into Myanmar Sustainable Development Plan (MSDP), a range of priority activities supporting the implementation of the MSDP can be co-funded from national budget.

For the priority areas, tentative budget requirements have been estimated. For a range of activities information needed for estimating the cost will be generated during the implementation of the NIP to make a reasonable estimate. Considering the larger

share of co-funding needed for GEF projects, appropriate and robust co-funding sources and approaches are needed. Therefore, approaches and strategies for funding and co-funding are compiled in resource requirement of Chapter IV in the NIP,

Action plans on technical and financial assistance (Articles 12 and 13) have been developed (Action Plans, including respective activities and strategies of Chapter III in NIP) to enable the country to obtain the needed financial and technical support required for the successful implementation of activities and actions to be carried out to achieve the overall objectives of the POPs Convention.

The Environmental Conservation Department (ECD) with the support of UNIDO has developed the first National Implementation Plan for the Stockholm Convention giving an overview on the POPs situation on Myanmar with a detailed action plan and priorities to be addressed to comply with the Convention. The NIP has been developed in a way that it can be mainstreamed with the Myanmar Sustainable Development Plan (MSDP) which is considered the major national strategy.<sup>1</sup> By mainstreaming with the MSDP, the NIP can contribute to specific topics in the overall framework of coordination and cooperation across all ministries, and all States and Regions to forge a common path towards the emergence of a prosperous, peaceful and clean Myanmar.

Several goals and related pillars/strategies of the MSDP can be supported by the NIP e.g:

- (1) GOAL 3 of MSDP: JOB CREATION & PRIVATE SECTOR-LED GROWTH and related strategies. For example, by supporting to develop POPs and other hazardous waste management companies or by supporting the development of recycling of waste fractions partly impacted by POPs;
- (2) GOAL 4 of MSDP: HUMAN RESOURCES & SOCIAL DEVELOPMENT FOR A 21ST CENTURY SOCIETY and the related strategies. For example, by improving research and education and awareness raising on chemical management and waste management or the development of analytical and monitoring capacity;
- (3) GOAL 5 of MSDP: NATURAL RESOURCES & THE ENVIRONMENT FOR POSTERITY OF THE NATION and related strategies. For example, by preventing the contamination of ecosystems to keep them healthy and functioning and by general protection of the environment from POPs pollution or secure and potentially clean-up

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<sup>1</sup>The Government of the Republic of the Union of Myanmar Ministry of Planning and Finance. Myanmar Sustainable Development Plan (2018 – 2030)

areas contaminated by POPs or other highly persistent chemicals. Also, the implementation of the NIP.

The strategy for implementation of the NIP is to mainstream it into the MSDP and support the implementation of the MSDP. The NIP has some complementary activities which can even improve the current MSDP. The current MSDP does not explicitly address chemicals or the waste hierarchy of the recovery of resources from waste or the circular economy approach. The NIP can positively enrich the MSDP in particular when appropriately mainstreamed with the Myanmar National Waste Management Strategy and Master Plan (2018-2030)<sup>2</sup> and Myanmar National Hazardous Waste Management Master Plan.<sup>3</sup>

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<sup>2</sup> Myanmar National Waste Management Strategy and Master Plan (2018-2030).

<sup>3</sup> Myanmar National Hazardous Waste Management in Master Plan, Draft for Consultation Purposes (2018)

# CHAPTER I

## 1 Introduction

Chapter I outlines the purpose and structure of the National Implementation Plan (NIP), including a summary of the Stockholm Convention (SC), its aims and its obligations. It also describes the mechanism used to develop the NIP and the stakeholder consultation process.

### 1.1 Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants (POPs) is a global treaty to protect human health and the environment from POPs that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health or on the environment. Exposure to POPs can lead to serious health effects including certain cancers, birth defects, dysfunctional immune and reproductive systems, greater susceptibility to disease and damages to the central and peripheral nervous systems.

In response to this global problem, the Stockholm Convention, which was adopted in 2001 and entered into force in 2004, requires its parties to take measures to eliminate or reduce the release of POPs into the environment. Myanmar signed to the SC in April 2004 and ratified in July 2004.

### 1.2 Provisions of the Stockholm Convention

Among others, the provisions of the Convention require each party to:

- (1) Prohibit or eliminate the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex A of SC Text to the Convention (Article 3);
- (2) Annex A of SC Text allows for the registration of specific exemptions for the production or use of listed POPs, in accordance with that Annex and Article 4 of SC Text, bearing in mind that special rules apply to PCBs. (Article 3 & 4);
- (3) Restrict the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex B of SC Text to the Convention (Article 3);
- (4) Annex B of SC Text allows for the registration of acceptable purposes for the production and use of the listed POPs, in accordance with that

Annex of SC Text, and for the registration of specific exemptions for the production and use of the listed POPs, in accordance with that Annex and Article 4 of SC Text;

- (5) Reduce or eliminate releases from unintentionally produced POPs that are listed in Annex C of SC Text to the Convention (Article 5);
- (6) The Convention promotes the use of best available techniques and best environmental practices (BAT/BEP) for preventing releases of POPs into the environment;
- (7) Ensure that stockpiles and wastes consisting of, containing or contaminated with POPs are managed safely and in an environmentally sound manner (Article 6);
- (8) The Convention requires that such stockpiles and wastes should be identified and managed to reduce or eliminate POPs releases from these sources. The Convention also requires that wastes containing POPs are transported across international boundaries taking into account relevant international rules, standards and guidelines;
- (9) To target additional POPs (Article 8);
- (10) The Convention provides for detailed procedures for the listing of new POPs in Annexes A, B and C of SC Text. A Committee composed of experts in chemical assessment or management - the Persistent Organic Pollutants Review Committee, is established to examine proposals for the listing of chemicals, in accordance with the process set out in Article 8 and the information requirements specified in Annexes D, E and F of SC Text;
- (11) Other provisions of the Convention relate to the development of implementation plans (Article 7), information exchange (Article 9), public information, awareness and education (Article 10), research, development and monitoring (Article 11), technical assistance (Article 12), financial resources and mechanisms (Article 13), reporting (Article 15), effectiveness evaluation (Article 16) and non-compliance (Article 17).

List of POPs in Annex A, B and C of the SC Text since 2017 are shown in following table below.

**Table 1. List of POPs in Annex A, B and C of the Stockholm Convention**

Annex A (Elimination)	Annex B (Restriction)	Annex C (Unintentional Production)
<p>Parties must take measures to eliminate the production and use of the chemicals listed under Annex A of SC Text. Specific exemptions for use or production are listed in the Annex of SC Text and apply only to Parties that register for them.</p>	<p>Parties must take measures to restrict the production and use of the chemicals listed under Annex B of SC Text in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex of SC Text.</p>	<p>Parties must take measures to reduce the unintentional releases of chemicals listed under Annex C of SC Text with the goal of continuing minimization and, where feasible, ultimate elimination.</p>
<ol style="list-style-type: none"> <li>(1) Aldrin</li> <li>(2) Chlordane</li> <li>(3) Chlordecone</li> <li>(4) Decabromodiphenyl ether</li> <li>(5) Dieldrin</li> <li>(6) Endrin</li> <li>(7) Heptachlor</li> <li>(8) Hexabromobiphenyl (HBB)</li> <li>(9) Hexabromodiphenyl ether and heptabromodiphenyl ether</li> <li>(10) Hexabromocyclododecane (HBCD)</li> <li>(11) Hexachlorobenzene (HCB)</li> <li>(12) Hexachlorobutadiene (HCBD)</li> <li>(13) Alpha-hexachlorocyclohexane (HCH)</li> <li>(14) Beta-hexachlorocyclohexane (HCH)</li> <li>(15) Lindane (Gamma-HCH)</li> <li>(16) Mirex</li> <li>(17) Pentachlorobenzene (PeCB)</li> <li>(18) Pentachlorophenol and its salts and esters (PCP, its salts and esters)</li> <li>(19) Polychlorinated biphenyls (PCBs)</li> <li>(20) Polychlorinated naphthalenes (PCNs)</li> <li>(21) Short-chain chlorinated paraffins (SCCPs)</li> <li>(22) Tetrabromodiphenyl ether and pentabromodiphenyl ether</li> <li>(23) Toxaphene</li> <li>(24) Technical endosulfan and its related isomers</li> </ol>	<ol style="list-style-type: none"> <li>(1) Dichlorodiphenyl trichloroethane (DDT)</li> <li>(2) Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (PFOS, its salts and PFOS-F)</li> </ol>	<ol style="list-style-type: none"> <li>(1) Polychlorinated dibenzo-p-dioxins (PCDD)</li> <li>(2) Polychlorinated dibenzofurans</li> <li>(3) (PCDF)</li> <li>(4) Hexachlorobenzene (HCB)</li> <li>(5) Pentachlorobenzene (PeCB)</li> <li>(6) Polychlorinated biphenyls (PCBs)</li> <li>(7) Polychlorinated naphthalenes (PCNs)</li> <li>(8) Hexachlorobutadiene (HCBD)</li> </ol>

In the case of some POPs listed in Annexes A and B of SC Text, the COP has adopted acceptable purposes and/or specific exemptions as presented in following table below.

**Table 2. Acceptable purposes and/or specific exemptions for POPs listed in the SC**

No.	Chemical	Annex	Specific exemptions / Acceptable purposes	Related (decision)
1.	Decabromodiphenyl ether (commercial mixture, c-decaBDE)	A	Production: As allowed for the parties listed in the Register Use: Vehicles, aircraft, textile, additives in plastic housings, polyurethane foam for building insulation, in accordance with Part IX of Annex A of SC Text	<u>SC-8/10</u>
2.	Hexabromocyclododecane (HBCD)	A	Production: As allowed by the parties listed in the Register of specific exemptions. Use: Expanded polystyrene (EPS) and extruded polystyrene (XPS) in buildings in accordance with the provisions of part VII of Annex A of SC Text	<u>SC-6/13</u>
3.	Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial OctaBDE)	A	Production: None Use: Articles in accordance with the provisions of Part IV of Annex A of SC Text	<u>SC-4/14</u>
4.	Lindane	A	Production: None Use: Human health pharmaceutical for control of head lice and scabies as second line treatment	<u>SC-4/15</u>
5.	Pentachlorophenol and its salts and esters	A	Production: As allowed for the parties listed in the Register in accordance with the provisions of Part VIII Annex A of SC Text Use:	<u>SC-7/13</u>

No.	Chemical	Annex	Specific exemptions / Acceptable purposes	Related (decision)
			Pentachlorophenol for utility poles and cross-arms in accordance with the provisions of Part VIII of Annex A of SC Text	
6.	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	B	Production: For the use below Use: Acceptable purposes and specific exemptions in accordance with Part III of Annex B of SC Text	<u>SC-4/17</u>
7.	Polychlorinated naphthalenes	A and C	Production: For the use below Use: Production of polyfluorinated naphthalenes	<u>SC-7/14</u>
8.	Technical endosulfan and its related isomers	A	Production: As allowed for the parties listed in the Register of specific exemptions Use: Crop-pest complexes as listed in accordance with the provisions of Part VI of Annex A of SC Text	<u>SC-5/3</u>
9.	Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial PentaBDE)	A	Production: None Use: Articles in accordance with the provisions of Part V of Annex A of SC Text	<u>SC-4/18</u>
10.	DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane)	-	Production: Use of vector control against diseases in accordance with Part II of Annex B of SC Text Use: Use of vector control against diseases in accordance with Part II of Annex B of SC Text	-

Source: Stockholm Convention website

### 1.3 National implementation plan

Article 7 of the SC requires that each Party must develop, and endeavour to put into practice, a plan setting out how it will implement its obligations under the SC. The SC imposes the obligation on the parties to develop, within two years of the ratification of the Convention, a NIP describing the national situation in respect of the substances covered by the SC and the strategies that have been developed to implement their obligations under the SC and to transmit the NIP to the Conference of the Parties (COP).

The goals of the current NIP of Myanmar are:

- (1) To set out the actions that Myanmar has undertaken regarding the reduction of the presence of POPs;
- (2) To propose actions that Myanmar will undertake in order to manage and eliminate POPs from entering the environment considering the Convention;
- (3) To inform the Conference of the Parties and Myanmar's community about national initiatives and projects designed to meet the requirements of the SC.

The NIP describes how Myanmar will fulfil its obligations under the SC to eliminate or reduce POPs releases to the environment and carry out environmentally-sound management of stockpiles of POPs-contaminated wastes and POPs-contaminated sites that pose high risks for human health and the environment, with a regional perspective.

The outcomes from the implementation of the NIP will include:

- (1) The protection of public health from the effects of POPs;
- (2) Meeting the obligations under the SC;
- (3) A structured POPs management;
- (4) Capacity building to maintain and monitor the quality of the environment and;
- (5) The coordination with related national plans.

The NIP will be updated as necessary to reflect decisions made by the Government and by the COP - such as amendments to the SC or its Annexes, including the addition of chemicals to Annexes A, B or C of SC Text, or adoption of guidance /guidelines.

#### **1.4 NIP development methodology**

The NIP is consistent with the GEF initial guidelines for enabling activities for the SC on POPs, and the guidance for developing a NIP (UNEP and The World Bank Group), including strategies required under Articles 5 and 6 of the Convention. The process of developing the NIP was supported financially by the GEF with the UNIDO as implementing agency.

Activities that have been conducted for developing the NIP were:

- (1) Establishing a coordinating mechanism through the SC Focal Person and the Project Working Committee to guide the process leading to the formulation and approval of the NIP;
- (2) Regarding Training, the task teams participated in different workshops and activities on national level that were aimed at raising awareness on the obligations to the SC and help to build or strengthen human capacity to implement the Convention at the national level. The national training workshop on NIP development and inventory development has been conducted concerning the different areas covered by the SC such as the basic POPs and new listed POPs (until COP6 in 2013), control and effects of unintentional POPs releases, PCBs, pesticides, legislation related to controlled substances, contaminated sites, etc. International expertise is engaged to conduct training to improve the capacity of local staff;
- (3) Establishment of basic and new listed POPs inventories and assessment of national, legal, infrastructure and institutional capacity to manage the new POPs have been executed. In order to assure a valid NIP, the development of the inventories of all POPs listed until 2013 was conducted within this NIP development. Relevant stakeholders received the Stockholm Convention inventory guidance documents and the updated UNEP toolkit to elaborate inventories;
- (4) An initial assessment of potentially impacted population in particular workers and related families have been conducted;
- (5) Regarding Monitoring and POPs management capacity, the review of the capacity which needs to monitor POPs and other chemical pollution and potential POPs destruction capacity has been conducted;
- (6) National priority assessment and objective was set up to accelerate reduction and elimination of the new POPs to support the implementation of the SC;
- (7) Development of action plans for implementation of the NIP has been conducted.

## 1.5 Structure of national implementation plan

The NIP comprises of the following four chapters:

- (1) Chapter I gives an introduction about the SC and its goals and provisions. It describes the structure of the NIP, an overview of the aims and goals of the NIP, as well as the process for the development of the NIP;
- (2) Chapter II outlines demographic, political and economic status of Myanmar. It elaborates on the environmental situation and the current status of the institutional, policy and regulatory framework. This chapter also presents the results of the assessment of POPs, focusing on the import and export, production, current and future use, registration, release, storage, disposal, and the potential impact. The POPs mentioned in this chapter are: POPs pesticides, PCBs, Dichlorodiphenyl-trichloroethane (DDT), new POPs, unintentional production POPs. The existing monitoring programmes, and the information exchange and awareness are also described in this chapter. Overall, it gives basic information on Myanmar's status regarding the management of POPs;
- (3) Chapter III presents an overview of recommended activities, strategies, and action plans which are recommended by Steering Committee and Task Team Leaders;
- (4) Chapter IV presents priority activities and capacity building for the individual priorities which link to Myanmar Sustainable Development Plan, related goals, strategies and budget related information to the activities of the action plan are mentioned.

## 1.6 Further considerations

### 1.6.1 Socio-economic assessment

A growing body of data on the links between pollution and health demonstrates the negative impacts, including contaminants from indoor exposure (e.g. heating/cooking, chemicals used indoor and chemicals in consumer products), outdoor air pollution, pesticide use, contaminants in food and drinking water, and contaminated sites with highest impact on health in developing countries with an estimated 12 to 14 millions deaths per year<sup>4,5,6</sup>.

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<sup>4</sup> Prüss-Ustün A, Wolf A, Corvalán C, Bos R, Neira M (2016) Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks. WHO report. ISBN 978 92 4 156519 6

<sup>5</sup> The Lancet Commission on pollution and health. <http://www.thelancet.com/commissions/pollution-and-health>

<sup>6</sup> Other studies see these diseases as the major reason for death (Institute for Health Metrics & Evaluation; <http://www.healthdata.org/gbd/publications>)

Open waste burning<sup>7,8</sup> and open biomass burning<sup>9</sup> contribute to the overall air pollution including Particulate Matter (PM 10; PM 2.5), Dioxins/UPOPs, PAHs, and heavy metals with plastic as a relevant contribution to open burning in urban area as fuel source<sup>8</sup>. POPs, POPs-like chemicals<sup>10</sup> and other toxic chemicals (including e.g. heavy metals), endocrine disrupting chemicals including POPs and their effects are main contributor to health associated costs also in industrial countries<sup>11,12,13</sup>. A recent assessment suggested that environmental chemical exposures contribute costs that may exceed 10% of the global domestic product.<sup>14</sup> Therefore, a more critical assessment of the burden of pollution from chemicals, industrial and other releases is needed.

References to socio-economic assessment can be found throughout the text of the Stockholm Convention.<sup>15</sup> These references indicate the importance of a socio-economic assessment when implementing the obligations under the Convention and when developing the updated NIP. GEF 2020 strategy suggests aligning global environmental objectives with priorities of national and global socio-economic development.

Annex F of SC Text is entitled “Information on socio-economic considerations” and provides an indicative list of items to be taken into consideration by Parties when undertaking an evaluation regarding possible control measures for chemicals being considered for inclusion into the Convention. The preamble to Annex F of SC Text states that: “An evaluation should be undertaken regarding possible control measures for chemicals under consideration for inclusion in this Convention, encompassing the full range of options, including management and elimination. For this purpose, relevant information should be provided relating to socio-economic considerations associated with possible control measures to enable a decision to be taken by the Conference of the Parties”.

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<sup>7</sup> Wiedinmyer C, Yokelson RJ, Gullett BK (2014) Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste. *Environ Sci Technol.* 48(16), 9523-9530.

<sup>8</sup> Kumar S, Aggarwal SG, Gupta PK, Kawamura K (2015) Investigation of the tracers for plastic-enriched waste burning aerosols. *Atmospheric Environment* 108, 49-58.

<sup>9</sup> Yadav IC, Linthoingambi Devi N, Li J, Syed JH, Zhang G, Watanabe H. (2017) Biomass burning in Indo-China peninsula and its impacts on regional air quality and global climate change-a review *Environ Pollut.* 227, 414-427.

<sup>10</sup> Scheringer, M., Stempel, S., Hukari, S., Ng, C.A., Blepp, M., Hungerbühler, K. (2012) How many Persistent Organic Pollutants should we expect? *Atmospheric Pollution Research*, 3, 383–391..

<sup>11</sup> UNEP & WHO (2013) *State of the Science of Endocrine Disrupting Chemicals – 2012*.

<sup>12</sup> Attina TM, Hauser R, et al. (2016) Exposure to endocrine-disrupting chemicals in the USA: a population-based disease burden and cost analysis. *Lancet Diabetes Endocrinol.* 4(12):996-1003.

<sup>13</sup> Trasande L, Zoeller T et al. (2015) Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union. *J Clin Endocrinol Metab.* 100(4), 1245–1255.

<sup>14</sup> Grandjean P., Bellanger M (2017) Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation. *Environmental Health.* 16:123

<sup>15</sup> UNEP (2007) Draft guidance on socio-economic assessment for national implementation plan development and implementation under the Stockholm Convention. UNEP/POPS/COP.3/INF/8.

The Conference of the Parties (COP), in its decision SC-1/12 requested the Secretariat of SC, in collaboration with other relevant organizations and subject to resource availability, to develop among others, additional guidance on social and economic assessment, and in doing so to take into consideration the particular circumstances of developing countries and countries with economies in transition. In response to that request, the Secretariat developed the draft guidance on socio-economic assessment for national implementation plan development and implementation under the Convention. According to the guidance, the Socio-Economic Assessment (SEA) is a systematic appraisal of the potential social impacts of economic or other activities such as the management of POPs in all sectors of society (including local communities and groups, civil society, private sector and government). It is a means of analysing and managing the intended and unintended social impacts, both positive and negative, of planned interventions (policies, programs, plans and projects) and any social change processes invoked by those interventions. Social impacts are the changes to individuals and communities that come about due to actions that alter the day-to-day way in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society.

In the context of managing POPs, social and economic impacts might include:

- (1) loss or improvement in livelihoods;
- (2) changes in cost of living;
- (3) cost of contaminated site management and remediation;
- (4) changes in employment, income and workplace protection;
- (5) opportunities for enterprise development (including Small and Medium Enterprises) and
- (6) changes in demand for public services, such as health and education.

The Socio-Economic Assessment will assist in taking actions that are appropriate and effective. Socio-Economic Assessment provides a basis for minimising the negative impact on the population and improving equitable outcomes for the most vulnerable groups. However, the socio-economic assessment lacks information on external costs. The unknown external costs can bias decisions and need to be compensated by taking precautionary approaches.

The human resource capacity on socio-economic assessment in Myanmar is rather limited and needs to be improved throughout the implementation of updated NIP.

Socio-Economic Assessment can help at any phase of development of the national implementation plan and during its implementation. If priorities have already been set in Phase I-III of the national implementation plan, then a socio-economic

assessment can be used in order to gain insight into the impacts of mitigation measures already decided. In this case, a brief investigation may be conducted for Phase IV. The results will assist in developing NIP communication strategies.

For Myanmar, the following socio-economic considerations and cost benefit analysis are highlighted as relevant. These key areas are considered as a frame for implementation without trying to apply usual socio-economic calculations requiring sophisticated single stakeholder assessments and often not leading to a practical outcome for developing countries where such information is not available. At the same time, these areas are partly related to national priorities for Sustainable Development<sup>16</sup>:

- (1) Food and water safety (including POPs exposure of population);
- (2) Exposure of vulnerable and highly exposed groups;
- (3) Management of chemicals and waste;
- (4) Cost of destruction and end of life management and treatment of POPs and other hazardous waste and
- (5) Cost of contaminated soil and site remediation.

The socio-economic considerations mentioned above are highlighted as most relevant.

### **1.6.2 Gender policy in NIP development and implementation**

Efforts to ensure sound management of chemicals, including POPs have important gender dimensions, because in daily life, men, women, and children are exposed to different kinds of chemicals in varying concentrations. Biological factors, notably size and physiological differences between women and men and between adults and children, influence susceptibility to health damage from exposure to toxic chemicals. Social factors, primarily gender-determined occupational roles, also have an impact on the level and frequency of exposure to toxic chemicals, the kinds of chemicals encountered, and the resulting impacts on human health.<sup>17</sup>

It is important that these gender dimensions be reflected at both site and policy level interventions for sound chemical management. The gender analysis is used to identify, understand, and describe gender differences and the impact of gender inequalities in a sector or program at the country level. Gender analysis is a required element of strategic planning and is the basic foundation on which gender integration is built. Gender analysis examines the different but interdependent roles of men and

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<sup>16</sup>Ministry of Forestry (MOF), National Commission for Environmental Affairs (NCEA) (2009). National Sustainable Development Strategy for Myanmar. <http://extwprlegs1.fao.org/docs/pdf/mya152933.pdf>

<sup>17</sup> United Nation Development Programme, Gender Mainstreaming. A Key Driver of Development in Environment and Energy, Energy and Environment Practice. Gender Mainstreaming Guidance Series;

women and the relations between the sexes. It also involves an examination of the rights and opportunities of men and women, power relations, and access to and control over resources. Gender analysis identifies disparities, investigates why such disparities exist, determines whether they are detrimental, and if so, looks at how they can be remedied<sup>18</sup>.

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<sup>18</sup> United States Agency for International Development (2011), Tips for Conducting a Gender Analysis at the Activity and Project Level. Additional Help for ADS Chapter 201;

## **CHAPTER II**

### **2 Country baseline**

Chapter II provides basic background information relevant to the NIP. It describes the current situation and state of knowledge in the country about POPs and the status of institutional and other capacity to address the problem.

#### **2.1 Country profile**

A brief country profile is given in order to place the NIP strategies and action plans in a country-specific context. It summarizes information on geography and population, membership in regional and sub-regional organizations, the country's political and economic profile, profiles of potentially important economic sectors in the context of the POPs issue, and overall environmental conditions and priorities in the country.

##### **2.1.1 Geography**

###### **2.1.1.1 Location**

The Republic of Union of Myanmar is located in South East of Asia continent. It is one of the members of the Association of Southeast Asian Nations (ASEAN) bordered by India and Bangladesh to its west, Thailand and Laos to its east and China to its north and northeast. The huge water body of Andaman Sea exists at its south. It has total of 5,876 km (3,651 miles) perimeter which includes an uninterrupted coastline of 1,930 km (1,200 miles) along the Bay of Bengal and the Andaman Sea. Myanmar is located at Latitude of 16° 52' 16.7196" N and Longitude of 96° 11' 57.7644" E. It spreads over 653,508 square kilometers on land and 23,070 square kilometers on water, having in total area of 676,578 square kilometers (261,228 square miles) which makes Myanmar the 40<sup>th</sup> largest nation in the world. Its capital city is "Nay Pyi Taw" which is located in the middle part of the country and the commercial city "Yangon", the former capital is located in the south of the country.

###### **2.1.1.2 Major mountains and rivers**

It owns probably the highest mountain of South East Asia with the height of (5,881 m), Hkakabo Razi, and the snowcapped mountain named Gamlang Razi, (5,870 m) and other Razi series. Beside snowcapped mountains, it also has some famous mountains in its religious and symbolic cultural places. Among them, Mount

Victoria 3,261.36 m (10,700 ft), Mount Popa, Mount Zwegabin and Mandalay Hill are the most well-known.

Myanmar also has the significant four rivers listed as follows; the Ayeyarwaddy River, the Chindwin River, Sittaung River and Thanlwin River. Ayeyarwaddy, the main river in Myanmar, is originated from the north of the country, at the meeting point of two small rivers which are known as Maykha and Maleikha. As it flows throughout the country, farmers, fishermen and local people mainly depend on it for their livings.

### **2.1.1.3 Weather and climate of Myanmar**

Most parts of Myanmar lie between the Tropic of Cancer and the Equator. It exists in the monsoon region of Asia with a result of having monsoon climate of hot and wet weather. According to Koppen-Gelger Climate Classification (1968-2010), there are seven generalized climate zones in Myanmar. Its coastal regions receive over 5,000 mm (196.9 in) of rain annually. Delta region gets approximately 2,500 mm (98.4 in) of rainfall. Meanwhile average annual rainfall in the Dry Zone in central Myanmar is less than 1,000 mm (39.4 in). The Northern Myanmar is the coolest part of the country with snowcapped mountains of Himalaya's mountain ranges. Its average temperature is of 21 °C (70 °F) while coastal and delta regions have maximum temperature of 32 °C (90 °F).<sup>19</sup>

## **2.1.2 Demography**

### **2.1.2.1 Population density in states and regions**

Myanmar is a country with a population of 51,486,253 (2014) and the nation's population density increased to 76 people per square kilometer in 2014. Significantly, Yangon Region has gained more than double density between 1973 and 2014 which reaches the highest population density over the whole country. Over-all population density steadily increases in each Regions and States. The increase in population varies based on the economics, literacy rate, weather and living standard of the specific area/region/state.<sup>20</sup>

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<sup>19</sup> Thein, Myat (2005). Economic Development of Myanmar. Singapore: Inst. of Southeast Asian Studies.

<sup>20</sup> Ministry of Immigration and Population , Myanmar Population and Housing Census, 2014.

### **2.1.2.2 Population growth rates in rural and urban areas**

The average annual growth rate of Myanmar is 0.9% (2014 census). The major increase rate takes place in Yangon Region, Shan State, Mandalay and Sagaing Regions. According to the report of 2014 Myanmar Population and Housing, Yangon Region is the only region where the population in urban areas is greater than in rural areas. With regard to the whole country, only 30% of the Myanmar population lives in urban areas while the majority of 70% lives in rural areas.

### **2.1.3 Political profile**

#### **2.1.3.1 States and regions**

Myanmar comprises officially seven States, seven Regions, and one Union Territory. Nay Pyi Taw, the capital city and surrounding townships stands by its self as a Union Territory. The fourteen States and Regions are listed; Kachin State; Kayah State; Kayin State; Chin State; Sagaing Region; Taninthayi Region; Bago Region; Magway Region; Mandalay Region; Mon State; Rakhine State; Yangon Region; Shan State and Ayeyawady Region.<sup>21</sup>

#### **2.1.3.2 Form of government**

Myanmar was colonized by British empire from 1885 to 1948. The country became independent after World War II in 1948. Myanmar established its Constitution in 2008. In 2010, the election was held and Myanmar became one of the democracy countries. Myanmar is an independent sovereign Nation. It is known as the Republic of the Union of Myanmar. There are three branches of sovereign power, namely: legislative power, executive power and judicial power. Those powers are shared among the Union, Regions, States and Self-Administered Areas. (Article 11. of Constitution of Republic of Union of Myanmar). The Head of the Union and the Head of Executive of the Union is the President. (Article 16. of Constitution of Republic of Union of Myanmar).

### **2.1.4 Economic profile**

With vast natural resources, a young and abundant population and ongoing political and economic reforms that have been enthusiastically supported by the international community, Myanmar has the potential to achieve fast economic

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<sup>21</sup> Constitution of Republic of Union of Myanmar (2008)

development.<sup>22</sup> On the other hand, such fast economic development can result in the release of POPs and other pollutants with the risk of human and environmental contamination.

#### **2.1.4.1 Agriculture**

Myanmar has a huge agricultural area of 12,645,000 which was reported and estimated by FAO in 2014.<sup>23</sup> Agriculture is the backbone of Myanmar's economy. Rice and paddy are the main agricultural products in Myanmar and followed by the beans in the second place. The GDP value gained from the agricultural section reached the peak at 59.99% of the Union in 1995 and has since decreased gradually. The main agricultural products are rice, pulses, beans, sesame, groundnuts, sugarcane, fish and fish products and hardwood.<sup>24</sup>

#### **2.1.4.2 Fishery**

The country aquaculture production has increased through these years. In every year, the amounts of aquaculture caught in freshwater are always high comparing to those caught in marine and brackish water. Increasing demands will provide better opportunities for increasing Myanmar's fish production.<sup>25</sup>

#### **2.1.4.3 Manufacturing**

Manufacturing is the sector with probably the highest potential returns for investors and it has garnered a lot of attention. Myanmar still has cheaper labor than virtually any other country in the world, so despite its infrastructure shortcomings, it remains attractive to labor intensive industries. Myanmar government is establishing Special Economic Zones (SEZ) in Thilawa, Dawei, and Kyaukphyu. Operations of these SEZ will promote the manufacturing sectors of Myanmar. Providing the support on small and medium-sized enterprises increases the manufacturing rate the country.

The country exports natural gas, wood products, pulses and beans, fish, rice, clothing, minerals, including jade and gems. According to 2016 statistics, 40.6% to Republic of China; 19.1% to Thailand; 8.8% to India; 7.6% to Singapore and 5.7 % to Japan were exported.

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<sup>22</sup> Soans A, Abe M (2015) Myanmar Business Survey – Data Analysis and Policy Implications, UNESCAP and Mekong Institute

<sup>23</sup> Website: <http://www.fao.org/countryprofiles/index/en/?iso3=MMR> FAO Country Profile (2014)

<sup>24</sup> Myanmar Profile CIA world facts book (2017).

<sup>25</sup> Food and Agriculture Organization of the United Nations, FAO year book of Fishery and Aquaculture Statistics, 2015

Major industrial sectors in Myanmar are textiles and garments, food and beverage products, construction materials, oil and gas sectors and investments in telecoms. The Ministry of Planning, Finance and Industry (MOPFI) has major responsibilities to facilitate a wide range of industrial sectors across Myanmar. More than 90% of Myanmar's overall economy is composed of private companies, with the remaining 10% made up of state-owned enterprises (SOEs). There are 48,187 private manufacturing industries with 60% of food and beverages industries in Myanmar (2016).<sup>26</sup>

#### **2.1.4.4 Energy**

Myanmar has a diverse energy sector that offers a multitude of opportunities to international and domestic investors. Myanmar's most significant potential lies in the oil and gas, hydropower, coal, and solar power industries. Myanmar's oil and gas industry has perhaps the most potential for the country. It is estimated that Myanmar, one to the world's oldest oil producers, has up to 3.2 billions barrels of oil and 18 trillions cubic feet (Tcf) of natural gas reserves (with unproven resources potentially expanding that figure). Gas comprises 90% of total Myanmar petroleum products, and Myanmar is the 10<sup>th</sup> largest producer of natural gas in the world.<sup>27</sup>

Myanmar also has great hydropower potential through its major rivers, which drain the four main basins of Ayeyarwaddy, Chindwin, Thanlwin, and Sittaung Rivers-capacity is estimated to be more than 100,000 MW.

According to the data of the Asian Development Bank (ADB), an estimated 400 coal occurrences have been identified in Myanmar, with significant occurrences in the Ayeyarwaddy and Chindwin river basins and in Shan state. Coal has mainly been found in the Sagaing, Magwe, and Tanintharyi Divisions.<sup>28</sup>

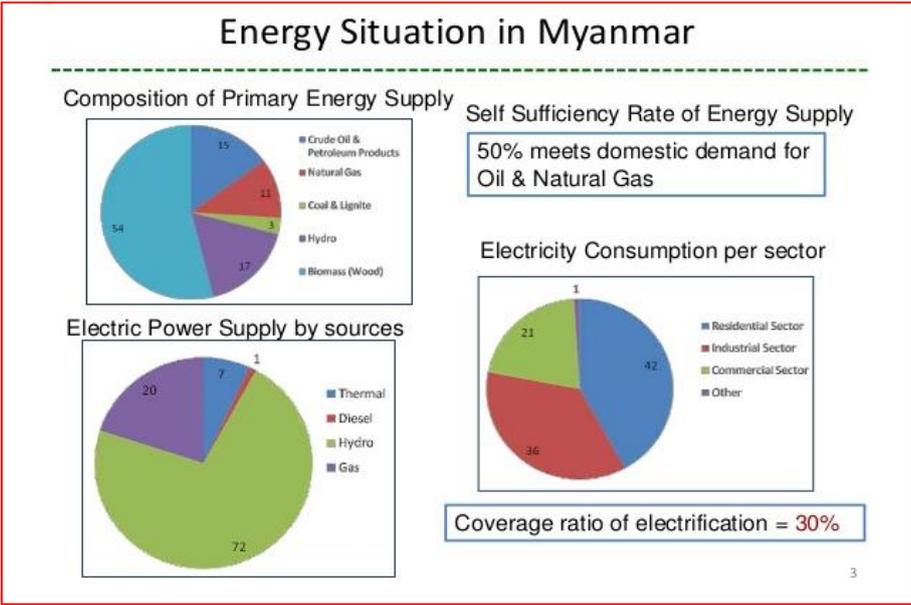
Solar energy is a new industry in Myanmar that had previously been untapped due to the expense of the technology and lack of financing. Renewable energy in Myanmar recently has been a focus of NGOs and social enterprises that are looking to bring clean energy sources to villages without power, but are concerned with environmental damage from coal or hydropower-related projects. Myanmar's energy sector is full of potential for foreign investors.

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<sup>26</sup> SINTEF and Norwegian Environment Agency, Myanmar National Hazardous Waste Management in Master Plan (Draft Outline), 2018

<sup>27</sup> BP Statistical Review of World Energy, 2011

<sup>28</sup> Asian Development Bank, Energy Sector Initial Assessment Myanmar, October, 2017



Source: Ministry of Planning, Finance and Industry (MOPFI)

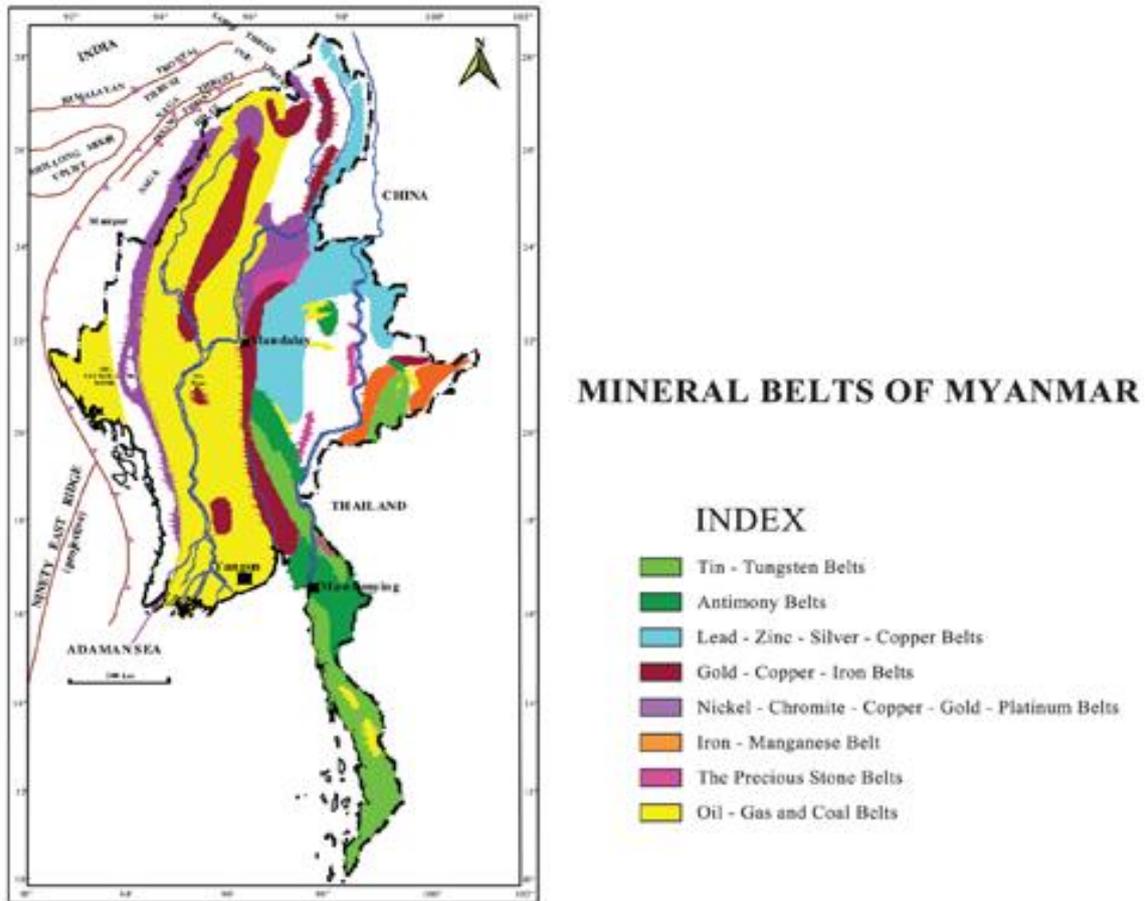
**Figure 1. Energy situation in Myanmar**

**2.1.4.5 Mining**

Myanmar has diverse and largely untapped geological resources which will make mining a significant driver of the country’s economic development in the decades to come. Especially, Myanmar has the potential to attract large scale foreign participation in the exploration and extraction of metals, ores and industrial minerals, especially copper, tin, tungsten, nickel and gold.<sup>29</sup>

Myanmar simultaneously faces three distinct types of challenges in mining project areas conflict over land, violent opposition to resource exploitation and environmental problems. As with most developing economies, Myanmar faces a number of environmental and infrastructure difficulties for mining companies including monsoonal flooding and road access to remote areas.

<sup>29</sup> Website: <http://sesprofessionals.com/overview-of-myanmars-mining-industry>



Source: Crossroads Magazine

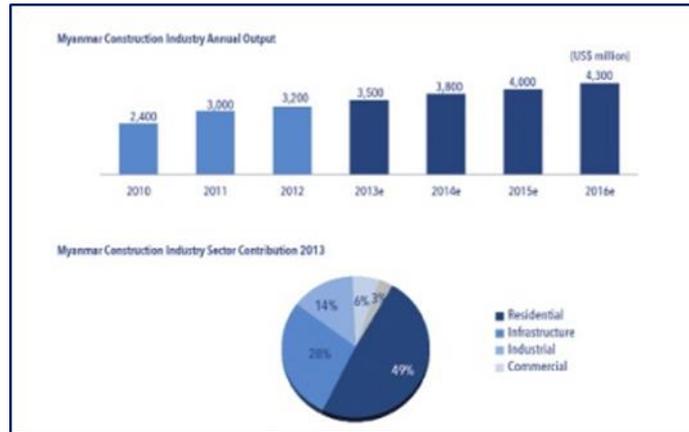
**Figure 2. Mineral belts of Myanmar**

#### 2.1.4.6 Construction

Myanmar's construction industry is set to become a major growth driver of Myanmar's economy, as investors look to capitalize on economic liberalization and a major public infrastructure programme. Changes to the regulatory framework and budget deficits have had an impact on the construction of houses, while plans to upgrade the country's infrastructure have faced economic and political constraints. Nonetheless, the government is determined to move forward with new regulations and secure funding for a series of major infrastructure projects, and players in the sector are generally optimistic about developments ahead.

According to Business Wire, Myanmar's construction sector registered a compound annual growth rate of 14.52% between 2009 and 2013 and is expected to continue to grow by around 12% per year up to 2018.<sup>30</sup>

<sup>30</sup> Business Wire Company, Construction in Myanmar- Key Trends and Opportunities to '2018'



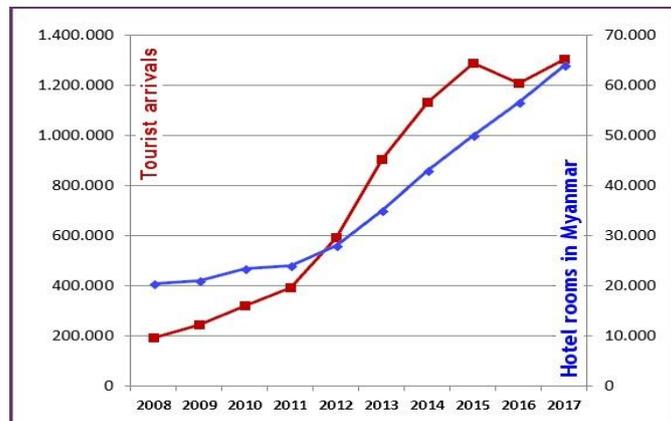
Sources: New crossroad Asia, updated at September 2012

**Figure 3. Myanmar construction industry annual output**

### 2.1.4.7 Hotel and tourism

Tourism sector is slowly developing. The government has encouraged tourism in the country since 1995. In 2010, 791,505 foreign tourists visited Myanmar. In 2012, foreign tourists reached to more than 1 million. The number of tourist arrivals showed a rise from 316,267 in November to 316,677 in December of 2017.<sup>31</sup>

In January 2001, there were 24 hotel projects with 4281 rooms with the investment of USD 558.03 millions. There were totally 1590 licensed hotels, motels and guesthouses with 63,978 rooms, recorded in Myanmar-Tourism-Statistics-2017.<sup>32</sup>



Sources: Ministry of hotels and tourism statistics.

**Figure 4. Myanmar tourism graph from 2008 until 2017**

<sup>31</sup> Trading Economic Website, Myanmar Tourist Arrivals 2012-2018.

<sup>32</sup> Ministry of Hotel and Tourism, Myanmar Tourism Statistics 2017

#### **2.1.4.8 IT and telecommunications**

The dialling code for the country is +95 and the top level internet domain for Burmese sites is .mm. The Myanmar government looks to be fully committed to further liberalise the market and aims to tackle the remaining obstacles progressively. By 2020, it targets to achieve that more than 90% of the population will have telephone access, more than 85% internet access and more than 50% high-speed internet access.

According to the results of liberalizing, the start of the operations by Ooredoo and Telenor, respectively in August and September 2014, subscribers have rolled in by the millions. By August 2019, Telenor boasted more than 21 million subscribers and Ooredoo more than 10 million. MPT, which has partnered with KDDI Corporation and Sumitomo Corporation to offer equally competitive services, remains the leading operator with more than 23 million subscribers. On January 2017, My Tel officially became the 4th operator in Myanmar. The joint venture company consists of government-owned Star High Public Co Ltd, Myanmar consortium (comprising of 11 companies) MTNH and the Vietnamese telecom company – Viettel with more than 18 million subscribers until August 2019 according to the global digital report. Myanmar mobile population coverage reaches 94.18% with 46 million internet users which are 85.22% of population.

#### **2.1.4.9 Wholesale and retail trade**

Foreign businesses and joint ventures are now allowed to carry out businesses in the retail and wholesale sector, according to the latest directive from the commerce ministry. Leading business groups hailed the move as a right step towards attracting inwards investments for Myanmar.

The Wholesale and Retail Trade value of Myanmar increased to 15,716,792.90 MMK in March 2017 from the previous number of 13,759,341.10 MMK for March 2016.<sup>33</sup>

#### **2.1.4.10 GDP of Myanmar**

The Gross Domestic Product (GDP) in Myanmar was worth 69.32 billions USD in 2017. The GDP value of Myanmar represents 0.11% of the world economy. GDP all-time average stands at 33.05 billions USD and its projection for 2018 is 67.1. GDP annual growth rate averaged 8.73% and is projected to be 6.5 in 2018.<sup>34</sup>

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<sup>33</sup> Wholesale and Retail Trade Value data remains active status in CEIC, Central Statistical Organization, 2018

<sup>34</sup> Trading Economic Website: Myanmar GDP 1998-2018



Sources: TRADINGECONOMICS.COM/WORLD BANK

**Figure 5. Myanmar GDP**

## 2.1.5 Environmental overview

### 2.1.5.1 Current environment quality in the country

In terms of environmental quality in Myanmar, research developments and national capacity for monitoring environmental status, human resources are still limited and the environmental data which is able to represent current environment conditions for the whole Myanmar is very slender. At present, Environmental Conservation Department (ECD), Forest Department, Directorate of Water Resources and Improvement of River Systems (DWIR), Department of Agriculture (DOA), Irrigation and Water Utilization Management Department, Department of Meteorology and Hydrology, City Development Committees (CDCs) like Yangon City Development Committee are partially conducting environmental surveys/monitoring (e.g. air, water, ecology).

Currently, the Environmental Conservation Department (ECD) is carrying out the necessary environmental surveys associated with water or air quality in some industrial areas merely in case of complaints. The regular survey/monitoring in national level over the whole country could not conduct so far.

The Forest Department is doing the environmental quality surveys like ecology status, water quality/level in famous lakes, environmental flow status and water quality status along the major rivers in the country with the supports of international organizations. The DOA is taking the surveys of soil quality under the projects like dry zone management in Myanmar. Irrigation and Water Utilization Management Department is conducting the water quality related monitoring in dams and reservoirs as a regular basic mainly with the purpose of irrigation water supply. Recently, the CDCs are also partially conducting regular monitoring of air quality in city areas, as well as water quality in water supply sources. The other ministries and the CDCs are

presently conducting environmental quality surveys such as air and water quality either under specified projects funded by international institutions or as basic requirement/activity of each department under the ministries. The Department of Meteorology and Hydrology has been operating as a National Focal at the Acid Deposition Monitoring Network in East Asia (EANET) since 2003, and measuring the acid rain in the rain, ion content, Electric-Conductivity (EC) on a monthly basis and monitoring the rainwater samples from 41 camps across Myanmar. At the Meteorological and Hydrological Office, Kabaraye region, Yangon, PM 2.5 monitoring equipments are being installed to monitor PM 2.5 and wet and dry deposition measurements are being conducted. Moreover, mercury monitoring equipment are also being installed with the equipment and technical assistant of Ministry of the Environment of Japan since October 2019 and monitoring the mercury content in the air monthly. PM 2.5 and mercury monitoring are not yet available nationwide.

#### **2.1.5.1.1 Water quality of the country**

There are four major river basins along Ayeyarwady River, Chindwin River, Sittoung River, and Thanlwin River in Myanmar. Among them, water quality surveys were carried out for only some area, like Ayeyarwady River, Chindwin River, Hlaing River, Dokehtawaddy River, etc. under various Project. For Ayeyarwady River, the DISI is cooperating in the project of Ayeyarwady Integrated River Basin Management (AIRBM) including Ayeyarwady State of the Basin Assessment with the support of World Bank and it is under on-going stage.

The study of water quality monitoring in the Chindwin River Basin by Stockholm Environment Institute in 2016 have conducted in Homalin area and Win Ma Nar area as shown in the following figure. Heavy metals like arsenic, iron, copper, mercury and lead were detected studied areas mainly in dry season. In all locations, the water quality parameters (Fe, turbidity, total suspended solid and total phosphorous) were observed beyond the WHO's drinking water standard.<sup>35</sup>

The Japan International Cooperation Agency (JICA) study for basic water environment management in Hlaing river in Yangon and Dokehtawaddy river and Taungtaman lake in Mandalay has conducted the surface water quality monitoring in 2015-2018. In Yangon, pollution level in Hlaing River was acceptable for conservation of aquatic lives, irrigation and water transportation for most parameters; deterioration of water quality in the dry season was observed. No harmful level of toxic substances in the water environment was found. In terms of spatial distribution

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<sup>35</sup> Stockholm Environment Institute, Water quality monitoring in the Chindwin River Basin, 2016.

of water quality, no clear deterioration from upstream to downstream in rainy season was seen. In terms of seasonal changes of water quality, it was worse in dry season than in rainy season. In terms of consideration for pollution impact from Industrial Zones, highly polluted in the creek directly receiving the wastewater from distilleries but apparently not high impact to Hlaing River observed within the scope of survey. In Mandalay, pollution impact from Industrial Zone to Doke Hta Waddy River was not so significant during study period. In Taung Tha Man Lake, Eutrophication manifested by high phosphorus and nitrogen was indicated. The water quality in the lake changes dramatically with seasons and hypereutrophic was observed in the dry season.<sup>36</sup>

### **2.1.5.1.2 Air quality of the country**

In Myanmar, some relevant organizations such as YCDC, and research institutes are merely performing the air quality monitoring under certain international aid projects as well as baseline air quality monitoring as a baseline data for proposing large-scale projects since few years ago. However, the national level air quality monitoring stations have not been established yet. Only the few findings by projects and the observation by the international organizations are described in this section.

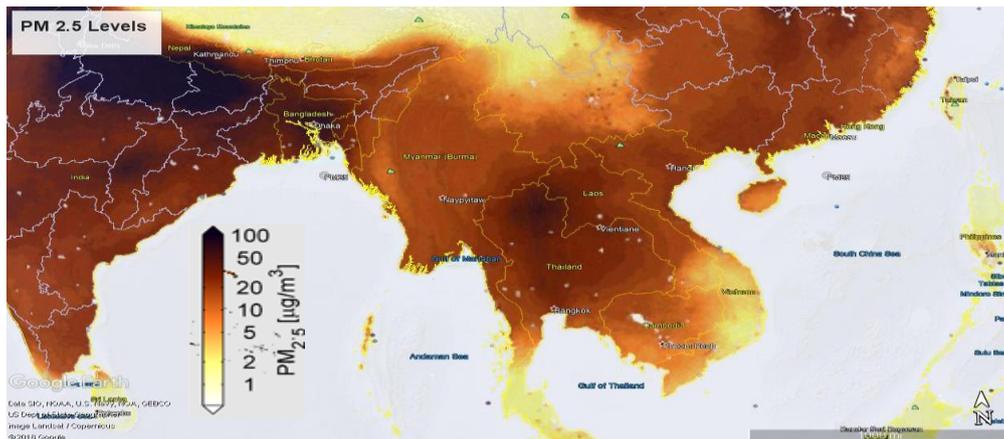
In accordance with the individual project report by YCDC known as air pollution management 2009, it was pointed out that air pollution is not serious for Yangon City yet by 2009, but it is evident that careful attention may be needed for the near future. Obviously, the air quality in cities are getting poor year by year due to the boosting of urbanization, and industrialization in the whole country as shown in above figures. The air quality measurement results in Yangon (2012-2013) in research study indicated that total suspended particles and PM 10 (24 hours) level were doubly higher than WHO standard.

According to the air quality monitoring all over the world by the international institutions, the air quality of Myanmar (PM 2.5 Levels and PM 10 Levels) were generally estimated. The average PM 2.5 level in Myanmar ranged mainly from 5 to 50  $\mu\text{g}/\text{m}^3$  in 2016 and less pollution was observed in northern and southern parts of Myanmar.<sup>37</sup>

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<sup>36</sup> JICA Study, "The Project for Capacity Development in Basic Water Environmental Management and EIA System in Myanmar", Presentation at ECD, 2018.

<sup>37</sup> Atmospheric Composition Analysis Group; US Department of State Geographer (Data SIO, NOAA, US. Navy, 2016)



Source: Atmospheric Composition Analysis Group; US Department of State Geographer (Data SIO, NOAA, US. Navy, GEBCO/ Image Landsat, Copernicus); [http://fizz.phys.dal.ca/~atmos/martin/?page\\_id=140](http://fizz.phys.dal.ca/~atmos/martin/?page_id=140)

**Figure 6. PM 2.5 levels in 2016**

The annual mean PM 10 levels in cities and towns in Myanmar from 2008-2016 showed the highest range of PM 10 levels in Yenanchaung, Taungoo, Pyin Oo Lwin, Namkham, Mawlamyaing and Kyaukphyu with more than  $100 \mu\text{g}/\text{m}^3$ . Basically, the annual PM 10 levels at all stations in cities and towns were quite higher than national guideline values.<sup>38</sup>

In Myanmar, some relevant organizations such as YCDC, and research institutes are merely performing the air quality monitoring under certain international aid projects as well as baseline air quality monitoring for proposing large-scale projects since few years ago. However, the national level air quality monitoring stations have not been established yet. In accordance with the individual project report by YCDC known as air pollution management 2009, it was pointed out that air pollution is not serious for Yangon City yet by 2009, but it is evident that careful attention may be needed for the near future.

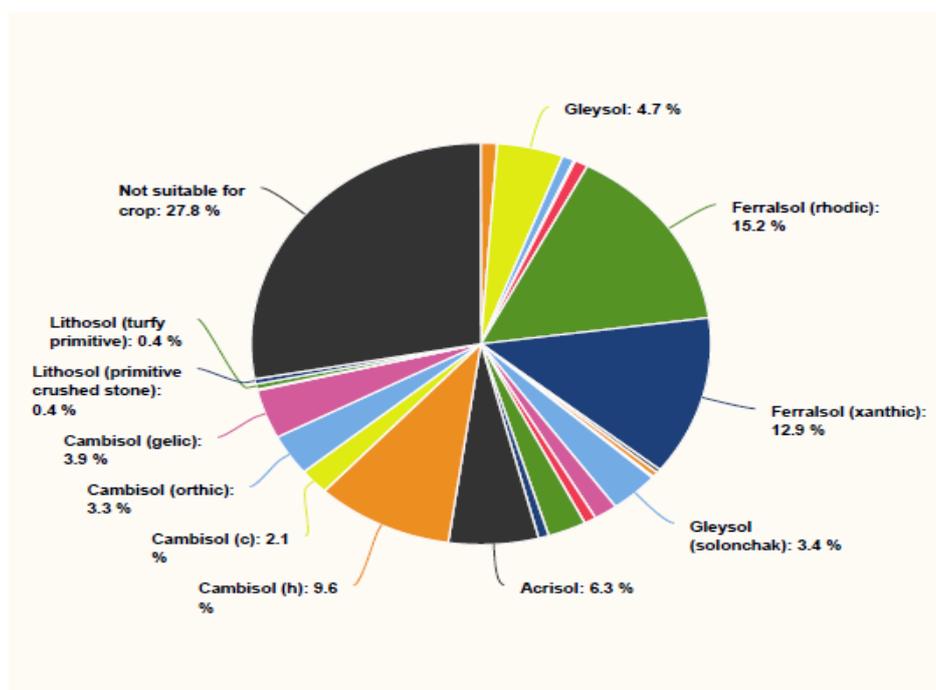
Obviously, the air quality in cities are getting poor year by year due to the boosting of urbanization, and industrialization in the whole country as shown in above figures. The air quality measurement results in Yangon (2012-2013) in research study indicated that total suspended particles and PM 10 (24 hours) levels were doubly higher than World Health Organization (WHO)'s standard.

<sup>38</sup> Ambient Air Pollution Database, WHO, 2018

### 2.1.5.1.3 Soil quality of the country

As a consequence of the wide range of climate and soil forming parents' rocks, soil types in Myanmar considerably vary.

Myanmar mainly contains the soil type: Ferralsol, Cambisol and Gleysol which are suited to grow rice, corns, rubber and mangoes trees. Almost one fourth of the country is formed with Ferralsol soil which is suitable for the abundant forest in Rakhine and Taninthari, and suitable for rubber, coconut and oil palm in hilly regions of Myanmar. The Cambisol soil is mostly found in hilly and mountainous regions; Shan, Myitkyina and Northern Myanmar which helps to have thick forestry areas in Myanmar. The soils in Myanmar is low in organic matter and nitrogen while in some regions have fairly high phosphate and potash which are good for crops and paddy.<sup>39</sup>



**Figure 7. Percentage of distribution of different soils in Myanmar**

Soils in Myanmar are in generally low content in nutrients and organic matter. Soil erosion is also a big issue in multiple areas, especially in places in the dry zone existing between two elevated regions-the Shan Highlands to the east, and the Rakhine Yoma and Chin Hills to the west (soil health Myanmar project). Desertification driven by deforestation, erosion, and salinization is intensifying in the central dry zone resulting in the decline of productivity of agricultural land (Mercycrop, dry zone Myanmar 2015). Soil erosion, particularly severe in upland

<sup>39</sup> Dr. Thin Nwe Htwe, Soil Types and General Soil Information in Myanmar, The 2nd Meeting of National Soil and Nutrient Management Expert Group for ASEAN Guidelines on Soil and Nutrient Management, 2016.

areas, is commonly occurred by the high intensity rainfall and rapid surface runoff. The soil alkalinity is typically high in the dry zone due to the use of saline groundwater for irrigation.<sup>40</sup>

### **2.1.5.2 Main environmental problems**

Likely all over the world, Myanmar is also encountering the various environmental problems in different sectors. Only the main environmental problems are listed below;

- (1) Deforestation: The 48.3% of Myanmar is covered with the forest, but 0.95% of forest has been lost between 1990 and 2010 according to the UNFAO. Many of the forest land convert into the rubber planting field. Expanding in agriculture sector, increasing population and exporting timber are the main cause of deforestation in Myanmar. Almost 70% (census 2014) of citizens lives in rural area where the livings have to depend mainly on the forests for basic needs;
- (2) Soil or land degradation: Mainly in upland area and dry zone area of Myanmar, the human actions like the inappropriate land use, improper crop patterns, poor agricultural practices such as excessive use of pesticides or fertilizers, and erosion of topsoil by improper use of agricultural machineries are resulting in the land/soil degradation problems for farmers and cultivators;
- (3) Habitat degradation and loss for wildlife and plants: The construction of hydropower dams and extensive distributions of mining projects over the country as well as overexploitation of wildlife animals and plants with economic purposes are threatening the habitat degradation as well as loss for wildlife and plants, respectively;
- (4) Natural disasters caused by climate change: Climate change has been inviting the natural disasters to Myanmar frequently since last few years ago. The deforestation, the population increasing and emission of gases from booming industries and mining projects are the main factors that cause the droughts, landslides, flood, cyclones and record-breaking intense rainfall events throughout the nation;
- (5) Industrial pollutions of air, soil and water: Due to the change in policy of nation in 2010, the economic has been developing rapidly with the enormous foreign investments. The weak policy, proper guidelines and procedures for environmental emission quality of industries and the

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<sup>40</sup> Mercy Corp, THE DRY ZONE OF MYANMAR A strategic resilience assessment of farming communities, 2015.

weakness of implementing the guidelines and monitoring the factories result the great pollutions of air, soil and water in Myanmar, leading the country to encounter many impacts;

- (6) Loss of biodiversity: The last frontier of biodiversity of Asia, Myanmar is currently under stress for having large wildlife trafficking, deforestation, habitat destruction of whole landscape and lack of strong policies to control the trading of endangered species. The limited technologies and finance in Myanmar draws back the enthusiasm of controlling the loss rate of biodiversity;
- (7) Hazardous and non-hazardous solid waste disposal: The collection and disposal process for solid waste is characterized by non-segregation of wastes, intermediate street-corner depots, informal recycling by rag pickers (at disposal site) and by waste handlers (during loading on to trucks), considerable manual handling and open dumping and open burning. The current infrastructure for treatment and disposal of hazardous waste in Myanmar is limited, there is a widespread lack of awareness and there are limited resources for monitoring and enforcement;
- (8) Surface and ground water pollution: The major source that dispose pollutants to the water are industrial wastewater, mining and agriculture as well as leaching from wastes and dumpsites. Mining industry dispose the heavy metal like lead, copper, cadmium and zinc, which have severe impact on health issues. The excessive consumption of pesticides around the country causes the problems to the surface and ground water sources;
- (9) Rapid depletion of the country natural resources: Myanmar has been concentrated in the oil/gas and hydropower sectors by the foreign investment. The excessive production of natural resources without control leads the rapid depletion of country natural resources and leaving the country behind with the problems associating in health and environmental issues;
- (10) Inadequate sanitation and water treatment contribute to disease: Limited human resources, techniques, experiences and finance are to be blamed for the inadequate sanitation and water treatment in Myanmar. Only 4.1% of households in Myanmar have piped water into the dwelling (2012). There were 5394 deaths caused by Diarrhoea attributable to WASH (2012);<sup>41</sup>

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<sup>41</sup> UNICEF, WASH Annual Report, Water, Sanitation and Hygiene, 2012

- (11) Poverty: The World Bank reported that about 32.1% (2015) of the Myanmar population is in poverty. The poverty impacts on the productivity, life quality, potential of youth and long-term growth of the nation;<sup>42</sup>
- (12) Over Population: As for the whole country, the population does seem like overcrowded. According to the 2014 Census, the population density of Yangon is incredibly larger in number than other states and regions having 716 people in a square kilometer what shows that the city is over crowded with the migrants from the rural area. The fact of having few job opportunities and other educational opportunities in the rural area ignites the young people to migrate to the city. Poor and inadequate facilities, public services initiate the insecurity and unsafe environment for the residence.

### **2.1.5.3 Institutional infrastructures in the country**

#### **2.1.5.3.1 Infrastructures of environmental conservation in Myanmar**

Basically, governmental ministries and organizations and various groups are involved from different perspectives for environmental conservation.

#### **Main stakeholders / institutions / organizations for environmental conservation**

Regarding environmental conservation in Myanmar, following committee/ ministry/ department are playing a vital role with different individual aspects focusing on setting environmental related policies, frameworks, strategies, regulations, guidelines, short-term and long-term action plans for controlling the environmental pollution by the wastes, effluents and emissions.

#### **National Environmental Conservation and Climate Change Central Committee**

The Environmental Conservation Central Committee was reorganized into the National Environmental Conservation and Climate Change Central Committee (NECCCCC) including climate change issues in June 2016 based on Notification No.35/2016, (02/06/2016) of the Union Government. The NECCCCC is led by Vice President U Myint Swe as the patron of the committee with deputy ministers, permanent secretary and director general of 21 ministries and private sectors. The main objective of this committee is to advice, coordinate and assist in implementing

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<sup>42</sup> Ministry of Planning and Finance and World Bank Group, "An Analysis of Poverty in Myanmar", 2017

the Law across all government institutions, including supervising to set the strategy and short-term and long-term action plan and guidelines for controlling the environmental pollution by the wastes, effluents and emissions.

The NECCCC has six working committees and each committee is led by Permanent Secretary. Region and State Environmental Conservation and Climate Change Supervision Committee are led by Minister Level.

### **Ministry of Natural Resources and Environmental Conservation (MONREC)**

The Ministry of Natural Resources and Environmental Conservation (MONREC) has altogether twelve departments and enterprises including the University of Forest and Environmental Science. The Forest Department's main responsibility is to manage the nation's forest land. It has responsibility to conserve and manage in cutting and produce the timber from precious hardwood and teak concerning the sustainability of the environment. Myanmar Timber Enterprise aims to control and administrate the nation's forest as a national property. Dry Zone Green Development is formed to improve and develop the greening environment in the dry region of Myanmar. It emphasizes planning and implementing the green development projects.

Environmental Conservation Department (ECD) conserves the natural and living environment in associated with guidelines that are qualified with the International Standards. Survey Department was transferred under to the MONREC in 2012 and it has been doing the survey work of project areas. Mining Department establishes the mining policy and monitoring the mining works in mining projects not to harm the environment and human beings. Department of Geological Survey and Mineral Explorer surveys and draws geological maps as well as explores new sources of the mineral. Mining enterprise 1 & 2 takes main responsibility of producing the natural minerals. Myanmar Gems Enterprise takes the responsibility of controlling the market of gems, and monitoring the production of gems in Myanmar Land. Myanmar Pearl Enterprise takes responsibility of tasks concerning with production and breeding of pearl. The ECD is a leading institution for environmental conservation and management. Regarding the way forward of ECD for implementation of environmental management, since the Environmental Impact Assessment (EIA) procedure was enacted in 2015, the series of actions by the ECD are necessary in order to implement the EIA procedure such as developing specific EIA guidelines and environmental management for specific sector; strengthening capacity to reviewing process in priority sector; developing framework for EIA review process; developing Environmental Compliance Certificate (ECC) framework; developing monitoring framework for EIA compliance; and developing institutional mechanism for

implementation and monitoring of EIA system. Moreover, the other essential actions are still required to prolong the actions by the ECD like sustainable financing mechanism, sustained political support, enforcement of legal compliance, strong coordination mechanism and institution, international cooperation, etc. To attain completeness and effectiveness of EIA system, the public participation and coordination also play an important role. Hence, the actions like the raising environmental education and awareness, promoting coordination and cooperation among institutions & stakeholders through consultation, promoting Cooperate Social Responsibility (CSR) and local community engagement are simultaneously taking into account by the ECD.<sup>43</sup>

### 2.1.5.3.2 Infrastructure of waste management in Myanmar

Since waste management in Myanmar has not systematically practiced yet, the unsorted waste is typically disposed at open dumping site. The open dumping sites in Yangon are listed as below.

**Table 3. List of open dumping sites capacity in Yangon**

No.	Name	Township / District	Capacity (Tonnes per day)	Area (ha)	Present Condition
1.	Htein Pin	Hlaing Thayar (West)	950	150 acres (70 acres used)	Open Dumping – will be full by 2021
2.	Dawei Chaung	North Dagon (East)	800	147 acres (47 acres used)	Open Dumping
3.	Shwe Pyi Thar (Kyaun Chaung)	Hlaing Thayar (West)	60	1	Open Dumping – WtE plant being set up
4.	Mingalardon	Mingalardon (North)	60	0.9	Open Dumping – Low landfill; temporary site
5.	Seikyi Khanaungto	Seikyi Khanaungto (South)	5	0.25	Open Dumping – Low landfill; temporary site
6.	Dala	Dala (South)	20	1.3	Open Dumping – Low landfill; temporary site

<sup>43</sup> D.G U Hlaing Maung Thein, Overview on Environmental challenges and way forward in Myanmar, SEWG Meeting, 2016.

In Mandalay, there are two final disposal sites located in north and south of Mandalay with the capacity of 450 ton/day and 300 ton/day, respectively. Both of the dumping sites are expected to be completely filled in 2019. Major cities like Yangon and Mandalay are facing the challenges in terms of operations and management of dumping sites. Moreover, the remaining lives of all the dumping sites in both cities are only to be between 2 to 5 years.<sup>44</sup>

Regarding the industrial waste management in Thilawa Special Economic Zone (Thilawa SEZ) in Yangon, a private waste management company, Golden Dowa Ecosystem Limited, is operating to manage hazardous and non-hazardous solid waste, recyclable waste, etc in the area of 42 hectare. The company has established engineering controlled and secured landfills with United States Environmental Protection Agency (USEPA) design standards with the capacity of 43,000 cubic meter for hazardous and 44,000 cubic meter for non-hazardous wastes in phase I of the project. New cells will be developed in next phases. It has constructed a shed in 1,050 square meter for sorting and stabilization of waste prior to the landfilling. Moreover, wastewater and leachate water treatment facilities with the capacity of treating 35 cubic meter per day of waste water have been installed employing the biological treatment with flocculation. It also has the laboratory with standard analytical equipment such as ICP, Ion chromatograph, Mercury analyzer, Spectrophotometer etc. Additionally, it demarcated an area for installation of incinerator in future. The company is currently providing solid waste management services for industries in Thilawa SEZ and has planned to extend its services for the other industries in other industrial zones in Yangon.

On the other hand, the solid waste management framework for Yangon has being prepared with the support of JICA. The preliminary solid waste management development plan is formulated with the aspects of from short term, middle term, and long term as shown in the following diagram.

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<sup>44</sup> SINTEF, Technical Baseline Report, Present Waste Management in Myanmar, Draft version, 2017



Source: JICA

**Figure 8. Solid waste management framework**

Moreover, ECD has developed Myanmar National Waste Management Strategy and Master Plan (2018-2030) for national wide level to ease the waste pollution issues over the country. With the support of Norwegian Environment Agency, ECD is drafting Myanmar National Hazardous Waste Management Master Plan.

### 2.1.5.3.3 Infrastructure of chemical management in Myanmar

The infrastructure or system for chemical management in Myanmar is very limited. Only the legal framework such as the prevention of hazard from chemical and related substances law and rules under the Ministry of Planning, Finance and Industry were recently enforced in 2013 and 2016, respectively. Myanmar has ratified in international agreements and treaties related to chemical management such as Stockholm Convention, Basel Convention, Vienna Convention, Montreal Protocol and London Amendment to the Montreal Protocol. The initial steps for compliance with the agreements have been initiated.

### 2.1.6 Health overview

In Myanmar, the Ministry of Health and Sports (MOHS) promotes health, prevents diseases, provides effective treatment and rehabilitating the health services. The Ministry of Health has the greatest responsibility for the country's health sector of citizen. Unlike other country, the traditional medicine along with allopathic medicine plays the important role in Myanmar Health system by setting up the 14 hospitals (in 1989) all around the country. Non-Governmental Organizations such as Myanmar

Maternal and Child Welfare Association and Myanmar Red Cross Society share some responsibility for the provision of health services in Myanmar.

### **2.1.6.1 Major environmental health risks**

Living or working in unhealthy conditions is leading thousands of people in Myanmar to an early grave, according to a report by the World Health Organization (WHO). The report found that 109,235 deaths over one year, or one out of every four deaths, could be attributed to environmental risks. With such a high burden of environment-related deaths, Myanmar ranked in the top 20 effected countries. Air, water and soil pollution, chemical exposures, ultraviolet radiation and climate change have become leading environment-based contributors to deadly diseases and injuries. The major environmental health risks in Myanmar are Diarrhea, Respiratory infections and Cardiovascular Diseases. The country stands at middle concerning with deaths caused by environmental health risks<sup>45</sup>.

### **2.1.6.2 Hospital and population ratio**

Myanmar has a population of 54,340,614 and population growth rate is 0.89 per minute in July 2019 according to data from the Department of Population, Ministry of Labour, Immigration and Population. According to data from MOHS, at July 2019, there will 1,114 hospitals in Myanmar. There will 10,918 health care facilities under Department of Public Health and 64 health care center under other ministries. Under MOHS, there will 40 traditional medicine hospitals.

### **2.1.6.3 Current conditions of health care programs**

#### **2.1.6.3.1 Tobacco control program**

In Myanmar, private health care services are regulated according to the Law relating to private health care services (2007) and its amendent law (2013). The Republic of Union of Myanmar has Tobacco control programme and officially launched in January, 2000. The destination of health facilities, basic education schools, sports fields and sports grounds as tobacco-free since 2002. The nation bans all the forms of direct and indirect advertising and promotions of tobacco products. The program is taken in action with the collaboration with the Ministry of Information, media personnel and through national NGOs.<sup>46</sup>

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<sup>45</sup> Myanmar Times, Environmental factors cause 1 in 4 deaths, Interview with WHO's Officer, 2016

<sup>46</sup> Ministry of Health, Brief Profile on Tobacco Control in Myanmar, 2009.

### **2.1.6.3.2 Tuberculosis control program**

Myanmar is one of the world's 22 high tuberculosis (TB) burden countries, with a TB prevalence rate three times higher than the global average and one of the highest in Asia. There were an estimated 180,000 new TB cases in Myanmar in 2010, more than 40,000 of them in children. The National TB Programme (NTP) is published a Five Year National Strategic Plan for Tuberculosis Control, 2011-2015 in 2010. It collaborates with national and international health and development agencies (such as; JICA, JATA, MSF-Holland, etc.)<sup>47</sup>

### **2.1.6.4 Medical and health facilities**

#### **2.1.6.4.1 Government facilities**

In Myanmar, Government Health Facilities are categorized as follow:

- (1) Hospitals under Department of Medical Services, Ministry of Health and Sports (Specialist Hospitals, Teaching Hospitals, 500 Bedded, 300 Bedded, 200 Bedded, 150 Bedded, 100 Bedded, 50 Bedded, 25 Bedded, 16 Bedded and Station Hospitals),
- (2) Health Facilities under Department of Public Health, Ministry of Health and Sports (Rural Health Center, Sub Center, Maternal and Child Health Center, Urban Health Center and School Health Team) and
- (3) Hospitals and Health Centers under Department of Traditional Medicine, Ministry of Health and Sports (100 Bedded, 50 Bedded, 25 Bedded, 16 Bedded and Traditional Medicine Clinic).

In Myanmar, number of government hospitals steadily increased from 824 in 2005-2006 to 1,144 in July 2019. In 2019, number of Traditional Hospitals and Traditional Medicine Facilities is 250. Under the Department of Public Health, number of health facilities increased from 1,890 in 2005-2006 to 10918 in July 2019.

#### **2.1.6.4.2 Licensed private facilities**

In Myanmar, Private Facilities that licensed from Ministry of Health and Sports are categorized as follow:

- (1) General Practitioner Clinic,
- (2) Specialist Clinic,
- (3) Private Hospital,
- (4) Diagnostic Center (Laboratory),

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<sup>47</sup> World Health Organization, Tuberculosis in Myanmar (Progress, Plans and Challenge), 2010

- (5) Diagnostic Center (X-ray),
- (6) Labor Room and
- (7) Dental Clinic.

According to data from Ministry of Health and Sports in 2018, the number of licensed private facilities are General Practitioner Clinic - 5,462, Specialist Clinic - 720, Private Hospital - 239, Diagnostic Center (Laboratory) - 217, Diagnostic Center (X-ray) – 137 and Labor Room – 45. According to the Statistical Year Book (2017), number of Dental Clinic was 750.

## **2.2 Institutional, policy and regulatory framework**

This section describes the present overall institutional, policy, and regulatory framework within which the NIP will be implemented. It also covers more detailed baseline information about the POPs issue such as the status of action and implementation activities under related Conventions or regional and sub-regional agreements. Myanmar law, rules and legislation issued for all sectors can be accessed at web page [www.mlis.gov.mm](http://www.mlis.gov.mm) which is uploaded by Myanmar law information system from Union Attorney General's Office.

Section 45 of the Constitution of the Republic of the Union of Myanmar (2008) provides that Union shall protect and conserve the natural environment. Then, its section 390 also provides that every citizen has the duty to assist the Union in carrying out, inter alia, preservation and safeguarding of cultural heritage, and environmental conservation.

It is provided in the Union Legislative List of the said Constitution contained in Schedule I, that the Union Hluttaw (parliament) may make laws for environmental protection and conservation including wildlife, natural plants and natural areas. Moreover, it is also provided in the Legislative List of the Executive Body of Self-administered Division or Area contained in Schedule III, that it may make laws for preservation of natural environment in accordance with law promulgated by the Union.

Myanmar has taken into consideration of environmental aspect in doing development measures since 1972 when the People's Health Law was enacted. However, it has not issued a particular development policy so far. The Myanmar National Environmental Policy covers the sustainable development aspects.

### **2.2.1 The present general legislative processes framework of Myanmar**

The present general legislative processes framework of Myanmar is as follows:

- (1) **The Formulation:** This is the fact-finding process. To collect the relevant information or data for drafting a law, it is necessary to invite all stakeholders including government departments, organizations, NGOs etc. concerned to send their representatives to the workshop or meeting held for that purpose. They are required to send their representatives who are in full authority to answer the relevant questions and make relevant decisions. They are also required to express their comment in writing.
- (2) **Determining Chapter Headings:** The administering Ministry or department shall form a core group consisting its officials, officials of other relevant Ministries and departments, and consultant/s, if any, to determine the chapters or main parts of the draft law and other important matters for the draft law. The Core Group generally consists of directors, deputy directors, i.e. mid-level officials and consultant/s. The Core Group study all information including the information and data received from the formulative workshop/meeting, prepare the first draft of the draft law and submit it to the relevant Ministry for approval.
- (3) **Drafting the First Draft of the Draft Law:** When the Core Group received the approval of the relevant Ministry on the titles of the chapter of the draft law, it starts to draft the detailed provisions chapter by chapter based on the information received in formulation workshop/meeting. Generally, the Core Group sits meetings once in two weeks. It usually invites the representative from the relevant ministry/s and Union Attorney General Office. Special meetings are held if necessary. When a draft chapter is complete or as required by the Ministry, it is submitted to the Steering Committee or Legislative Drafting Committee (which is generally) headed by a Deputy Minister and consisted of high level officials of the Ministry.
- (4) **Approval of the Steering Committee or the Legislative Drafting Committee on the Draft Law:** The secretary of the Core Group, on behalf of the Core Group, presents the first draft of the draft law to the Steering Committee using presentations. If the Steering Committee guides to amend the draft law, the Core Group has to follow the guidance. The Steering Committee sets policies and gives guidance on the draft. The Core Group amends the draft law according to such policies and guidance.
- (5) **Approval of the Relevant Minister:** When the Steering Committee agrees with the draft law, the Core Group submit it to the Minister for his approval.

- (6) **Vetting by the Union Attorney General's Office (UAGO):** The draft law is sent to UAGO for its vetting. The Core Group has to hold meetings for amending draft law as required by UAGO, and take time to send it back to UAGO until UAGO provides no comment on the draft law.
- (7) **Cabinet Approval on the Draft Law:** When the Ministry and UAGO provide no comment on the draft law, the Ministry sends the draft law, accompanied with UAGO's comment on the draft law, to the Cabinet for its approval. The Cabinet, through its Committee: the Security, Stability and Rule of Law Committee, reviews the draft law. If the Cabinet directs to amend the draft law, the Ministry has to follow it.
- (8) **Submitting the Draft Law to the Parliament:** When the Cabinet approves the draft law, it is submitted to the Pyidaungsu Hluttaw (Union Parliament) by the relevant Ministry.
- (9) **Publishing the Draft Law for Public Comment:** When the relevant Ministry submits the draft law to the Pyidaungsu Hluttaw, the draft law is published in a public newspaper for the public awareness and public comments.
- (10) **Allocating Duty to Read the Draft Law by the Relevant Hluttaw:** The Pyidaungsu Hluttaw allocates duty to read the draft law by any of the Pyithu Hluttaw (Peoples's Assembly) or the Amyotha Hluttaw (National Assembly).
- (11) **The Draft Law Committee:** The relevant assembly assigns the duty to its committee to read the draft law, and to submit its finding to the Hluttaw meeting. The Draft Law Committee invites the officials from the Ministry concerned, UAGO and officials of other relevant ministries and representatives of NGOs in reading the draft law. The relevant assembly may discuss on the report of the Draft Law Committee.
- (12) **The Joint Draft Law Committee:** Both Hluttaws disagree on the draft law or any of its part, they assign duty to the Joint Draft Law Committee to discuss on the points disagreed. The Joint Draft Law Committee invites the officials of the relevant ministries, UAGO and discussed on the points disagreed. Then, the Joint Draft Law Committee reported to the meeting to Pyidaungsu Hluttaw. The Pyidaungsu Hluttaw decided finally on the draft law.
- (13) **Sending the Draft Law to the President of the Union (President) for his Comment or Approval:** When the draft law is agreed by both assemblies or when it is decided by the Pyidaungsu Hluttaw on the

presentation of the Joint Draft Law Committee, the Pyidaungsu Hluttaw send it to the President for his comment or signature.

- (14) **Publishing the Law:** After a President signs the draft law, it becomes law and will be published in the public newspaper.
- (15) **Rule Making:** If the law has the provisions on vesting powers for making delegated legislations: i.e. rules, regulation, by-law, notification, order, procedure, the relevant ministry or organization makes the relevant delegated legislation.
- (16) **Submitting Draft Law:** The draft law on the union budget, planning and taxation may be submitted only by the cabinet according to the provisions of the state constitution. Except those, any draft law may be submitted by the ministry concerned, union level organization, Hluttaw committee and member of parliament. Moreover, the political parties, NGOs and individuals may prepare and submit the draft law through a member of parliament. The people may also send their opinions and suggestions on the draft law to the speakers of Hluttaw. Myanmar legislative framework covers various fields including constitution matters, administration, accounting, budget and economy, agriculture, livestock breeding, civil, criminal, judiciary, civil service, commercial, culture, defence, development, education, election, revenue, foreign affairs, health, parliamentary matters, immigration, hotels and tourism, industry, communications, information, labour, land, mining, religion, science and technology, social, transportation and others. Myanmar has about 624 existing laws still under application. In addition, Myanmar has various customary laws for each ethnic nationality. Though such customary laws are not enacted by the hluttaws, they are regarded as binding laws.

The Ministries and Union level organizations issue the delegated legislations: rules, regulations, by-laws, notifications, procedures, orders and directives to implement the laws concerned. Those delegated legislations have also legal authority.

### **2.2.2 Profile of the union government and region or state governments**

There is the Union Government and the Region or State Government in Myanmar. The Constitution, the Union Government Law and the Region or State Government Law has provisions concerning the Union Government and the Region and State Government. There is a Union level government at the Union level, led by the President and comprised 21 ministries: the Ministry of the State Counsellor's Office, Ministry of the President's Office, Ministry of Foreign Affairs, Ministry of

Agriculture, Livestock and Irrigation; Ministry of Transport and Communications, Ministry of Religious Affairs, Race and Culture, Ministry of Natural Resources and Environmental Conservation, Ministry of Electricity and Energy, Ministry of Labour, Immigration and Population, Ministry of Planning, Finance and Industry (MOPFI), Ministry of Health and Sports, Ministry of Education, Ministry of Construction, Ministry of Social Welfare, Relief and Resettlement; Ministry of Hotels and Tourism, Ministry of Commerce, Ministry of Information, Ministry of Ethnic Affairs, Ministry of Defence, Ministry of Home Affairs and Ministry of Border Affairs. Moreover, the Union Attorney General is a member of the Union Government. The Union Civil Service Board, the Union Election Commission, the Union Auditor General's Office, the Anti-corruption Commission, the Myanmar National Human Rights Commission were also formed at the Union level.

The Union Government is responsible for the governance of the whole country generally and the Union territory. The Union Government may exercise the powers vested in the matters mentioned in Schedule (1): Union Legislative List of the State Constitution. The Region or State Governments may exercise powers invested to them in the matters contained in the Schedule (2): Region or State Legislative List. There are 7 Region governments and 7 state governments. If a matter is not clear whether it falls under the union legislative list or the region or state list, the union government has the power to handle that matter.

The Region or State Governments are responsible for the governance of their relevant region or state for the matters mentioned in the Schedule (2) of the State Constitution.

If any dispute arises between the union government and any region or state government, or between the region or state governments relating to their powers, the dispute may be referred to the constitutional tribunal of the union.

Moreover, the Myanmar Parliamentary Union (MPU) has been formed comprising the Pyidaungsu Hluttaw and Region or State Hluttaws. Thus, the disputes or issues arisen between them may be settled through MPU.

### **2.2.3 Environmental policy and legislative overview for POPs chemical and pesticide management including enforcement and monitoring requirements**

#### **2.2.3.1 National Environmental Policy of Myanmar**

The Government of the republic of the Union of Myanmar enacted the National Environmental Policy of Myanmar on 5<sup>th</sup> June 2019. “This new National Environmental Policy of Myanmar provides long-term, strategic guidance for

achieving the sustainable future we want. It requires the mainstreaming of environmental protection into planning and decision-making at all levels of government and in all sectors. Its detailed principles respect livelihood needs and development objectives while at the same time recognizing the full value of our ecosystems and the implications of our changing climate. This Policy ensures that environmental protection continues to be a central objective in Myanmar's sustainable development without losing sight of the importance of a pragmatic approach based on an awareness of the constantly evolving world around us" are stated at the Foreword of State Counsellor, the Republic of the Union of Myanmar.

### **2.2.3.2 The Environmental Conservation Law**

The Environmental Conservation Law (ECL) was enacted on 30<sup>th</sup> March 2012. It is the framework law in Myanmar for environmental protection and conservation. The law provides about its Title and Definition in Chapter I, Objectives in Chapter II, Formation of the Environmental Conservation Committee in Chapter III, Duties and Powers relating to the Environmental Conservation of the Ministry in Chapter IV, Environmental Emergency in Chapter V, Environmental Quality Standards in Chapter VI, Environmental Conservation in Chapter VII, Management of Urban Environment in Chapter VIII, Conservation of Natural Resources and Cultural Heritages in Chapter IX, Prior Permission in Chapter X, Insurance in Chapter XI, Prohibitions in Chapter XII, Offences and Penalties in Chapter XIII and Miscellaneous in Chapter XIV.

The objectives of this law mentioned in its section 3 are to enable to implement the Myanmar National Environmental Policy, enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process; enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations; reclaim ecosystems as may be possible which are starting to degenerate and disappear; enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially; enable to implement for promoting public awareness and cooperation in education programmes for dissemination of environmental perception; enable to promote international, regional and bilateral cooperation in the matters of environmental conservation, and to enable to cooperate with Government departments, Government organizations, international organizations, non-governmental organizations and individuals in matters of environmental conservation.

Its section 13 provides that the Ministry shall, under the guidance of the Committee, maintain a comprehensive monitoring system and implement by itself or

in coordination with relevant Government departments and organizations in the following matters:

- (1) The use of agro-chemicals which cause to impact on the environment significantly;
- (2) Transport, storage, use, treatment and disposal of pollutants and hazardous substances in industries;
- (3) Disposal of wastes which comes out from exploration, production and treatment of minerals, industrial mineral raw materials and gems;
- (4) Carrying out waste disposal and sanitation works;
- (5) Carrying out development and constructions and
- (6) Carrying out other necessary matters relating to environmental pollution.

Its section 30 prohibits that no one shall, without permission of the Ministry, import, export, produce, store, carry or trades any material which causes impact on the environment prohibited by the Ministry.

Section 34 also provides that whoever imports, exports, produces, stores, carries or trades any material prohibited by the Ministry due to its impact on environment shall, on conviction, be punished with imprisonment for a term from a minimum of three years to a maximum of five years, or with fine from a minimum of one hundred thousand kyats to a maximum of two million kyats, or with both. Moreover, he shall incur the expenditure for the treatment and disposal of such material until the process has no impact on the environment.

The Environmental Conservation Department is formed under the Ministry of Natural Resources and Environmental Conservation. Such Department and its regional offices in various Regions and States are performing their functions and duties to protect and conserve the environment including preventing the hazards from chemicals, related substances and POPs.

### **2.2.3.3 The Environmental Conservation Rules**

The Environmental Conservation Rules were issued under the Notification No. 50/2014 of the Ministry of Environmental Conservation and Forestry dated on 5<sup>th</sup> June 2014. The rules provide about Title and Definition in Chapter I, Adopting Policy Relating to Environmental Conservation in Chapter II, Environmental Conservation in Chapter III, International, Regional and Bi-lateral Cooperation Relating to Environmental Conservation in Chapter IV, Environmental Management Fund in Chapter V, Environmental Emergency in Chapter VI, Environmental Quality Standards in Chapter VII, Management of Urban Environment in Chapter VIII, Waste

Management in Chapter IX, Conservation of Natural Resources and Cultural Heritages in Chapter X, Environmental Impact Assessment in Chapter XI, Prior Permission in Chapter XII, Prohibitions in Chapter XIII, Miscellaneous in Chapter XIV.

#### **2.2.3.4 Environmental Impact Assessment Procedure**

Environmental Impact Assessment (EIA) Procedure was issued under the Notification No. 616/2015 of the Ministry of Natural Resources and Environmental Conservation dated on 29<sup>th</sup> December 2015. These procedure provides about titles and definitions in Chapter I, establishment of the Environmental Impact Assessment (EIA) process and requirements concerning third person or organization undertaking IEE and EIA in Chapter II, screening in Chapter III, Initial Environmental Examination (IEE) in Chapter IV, Environmental Impact Assessment (EIA) in Chapter V, appeal process in Chapter VI, Environmental Management Plan (EMP) in Chapter VII, environmental consideration in project approval in Chapter VIII, monitoring in Chapter IX, strategic environmental assessment in Chapter X and administrative punishment in Chapter XI.

Moreover, report preparation, submission, review and approval process for IEE reports, EIA process, scoping, investigation, EIA report requirements, submission of EIA report, review and approval process for EIA report, EMP process, Environmental Compliance Certificate (ECC) conditions and revisions to conditions, responsibility to adverse impacts, monitoring and inspection by Ministries, relevant government departments and organizations are described in detail depending on project size and conditions.

#### **2.2.3.5 National Environmental Quality (Emission) Guidelines**

National Environmental Quality (Emission) Guidelines was issued under the Notification No. 615/2015 of the Ministry of Natural Resources and Environmental Conservation dated on 29<sup>th</sup> December 2015. This guideline provides about general provisions in Chapter I and implementation procedures in Chapter II. In addition, general guidelines and industry-specific guidelines are also described in Annex A of SC Text according to requirements of different sectors. These National Environmental Quality (Emission) Guidelines provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.

### **2.2.3.6 The Prevention of Hazard from Chemicals and Related Substances Law**

Another important law in industrial sector for the prevention of hazards from chemicals is the Prevention of Hazard from Chemicals and Related Substances Law enacted on 6<sup>th</sup> August 2013. The law applies POPs and other chemicals and related substances. The law provides about Title and Definition in Chapter I, Aims in Chapter II, Formation of the Central Leading Board in Chapter III, Duties and Powers of the Central Leading Board in Chapter IV, Formation of the Central Supervisory Board and its Duties and Powers in Chapter V, Formation of the Board of Inspection and its Duties and Powers in Chapter VI, License Permitted for the Chemical and Related Substances Businesses in Chapter VII, Registration Certificate in Chapter VIII, Hazard Control and Decrease in Chapter IX, Invalidation and Reapplication of License in Chapter X, Administrative Action and Appeal in Chapter XI, Prohibitions in Chapter XII, Offences and Penalties in Chapter XIII and Miscellaneous in Chapter XIV. The aims of this Law are:

- (1) To protect from being damaged the natural environment resources and being hazardous any living beings by chemical and related substances;
- (2) To supervise systematically in performing the chemical and related substances business with permission for being safety;
- (3) To perform the system of obtaining information and to perform widely educative and research for using the chemical and related substance systematically;
- (4) To perform the sustainable development for the occupational safety, health and environmental conservation.

Under the provisions of this law, a Central Leading Board, the Central Supervisory Board and the Inspection Board are formed. According to section 13 of the Law, it requires a person who wants to operate the chemicals and related substances to apply to obtain a license with the management working plan relating to the environmental conservation to the Central Supervisory Board in accord with the stipulations.

The duties of license holder are prescribed in sections 15 to 18. Chapter 8, from sections 20 to 23, provides about the Registration Certificate. Moreover, Chapter 9, in section 27, provides about the Hazard Control and Decrease.

### **2.2.3.7 The Prevention of Hazard from Chemicals and Related Substances Rules**

In exercise of the power conferred under sub-section (a) of section 47 of the Prevention of Hazard from Chemicals and Related Substances Law, the Ministry of

Planning, Finance and Industry issued its rules on 12<sup>th</sup> January, 2016 under its notification No. 85/2015-2016. It contains 83 rules, 19 chapters and forms.

It provides about Title and Definition in Chapter I, Duties and Powers of the Central Leading Board in Chapter II, Duties and Powers of the Central Supervisory Board in Chapter III, Application and Issue of Licence and Recommendation in Chapter IV, Facts which shall be abided by a Licence Holder in Chapter V, Application and Issue of a Registration Certificate in Chapter VI, Formation of the Advisory Board in Chapter VII, Formation of the Technician Team and Duties Thereof in Chapter VIII, Functions and Duties of the Supervisory Board in Chapter IX, Functions and Duties of the Board of Inspection and Powers Thereof in Chapter X, Performing for Safety Measures in Chapter XI, Facts which shall be abided by and performed to Prevent and Decrease from the Accident in Chapter XII, Facts which shall be abided by Transporting in Chapter XIII, Facts which shall be abided by Storing in Chapter XIV, Facts which shall be abided by Using in Chapter XV, Facts which shall be abided by Discharging in Chapter XVI, Facts which shall be abided by in the Laboratory in Chapter XVII, Abiding by the International Agreements Relevant with Chemical and Related Substances in Chapter XVIII and Miscellaneous in Chapter XIX.

The Central Leading Board for Preventing Hazard from Chemicals and Related Substances, Ministry of Planning, Finance and Industry issued the Notification No. 3/2016 on 30th June, 2016 and declared the list of prohibited chemicals. The banned chemicals include 26 items of POPs stipulated by the Stockholm Convention, 1 item of chemical banned by Vienna Convention and Montreal Protocol, 26 items of pesticide issued by the Pesticide Registration Board, 12 items of chemical contained in the Schedule-1 of the Chemical Weapon Convention, totally 65 items of chemical. Those chemicals were stipulated as banned chemicals according to sub-section (b) of section 5 of the Law.

The 26 POPs, stipulated by the Stockholm Convention, and banned under such notification are : (1) Aldrin, (2) Chlordane, (3) Dieldrin, (4) Endrin, (5) Heptachlor, (6) Hexachlorobenzene (HCB), (7) Mirex, (8) Toxaphene, (9) Polychlorinated Biphenyls (PCBs), (10) Chlordecone, (11) Alpha Hexachlorocyclohexane (a-HCH), (12) Beta Hexachlorocyclohexane (b-HCH), (13) Lindane (Gamma Hexachlorocyclohexane), (14) Pentachlorobenzene (PeCBz), (15) Hexabromobiphenyl (HBB), (16) Hexabromodiphenyl Ether and Heptabromodiphenyl Ether, (17) Tetrabromodiphenyl Ether and Pentabromodiphenyl Ether, (18) Dichlorodiphenyltrichloroethane (DDT), (19) Perfluorooctane Sulfonic Acid (PFOS) its salts and PFOS-fluoride, (20) Dioxins (Polychlorinated-dibenzo-p-dioxins - PCDD), (21) Furans (Polychlorinated-dibenzofurans - PCDF), (22) Endosulfan, (23) Hexabromo cyclododecane (HBCD),

(24) Polychlorinated Naphthalenes (PCNs) , (25) Hexachlorobutadiene (HCBD), and (26) Pentachlorophenol, its salts and esters (PCP).

Any of those POPs are not allowed to import, export, use, store, transport, sell, buy, exchange etc. in Myanmar. Generally, the Instrument Scrutiny Division, Industrial Cooperation Department, Ministry of Planning, Finance and Industry checks the applications for the recommendation of the Ministry of Planning, Finance and Industry relating to the application for import license, for the import of any chemical, to the Ministry of Commerce. Without such recommendation of Ministry of Planning, Finance and Industry and the Ministry of Commerce will not issue the import license for the chemicals.

In checking such applications, the Division requires the applicant to submit the recommendation of the relevant Ministry. For example, if one applies to issue the recommendation on the import of chemical, which may be used in manufacturing narcotic drugs, the Division will require to produce the recommendation of the Ministry of Home Affairs.

Likewise, if one applies to issue recommendation on the import of chemical which may be used in mining, will be required to produce the copy of mining permit. In these processes, the Department of Research and Innovation (DRI), Ministry of Education, issues the analysis report after examining the sample of the item which is desirous to be imported.

A copy of such analysis report must be attached in applying to the Division. If the chemical which is applied to import is not banned or controlled, the Division issues the recommendation to the applicant for producing it to the Ministry of Commerce in applying import license of chemical. As POPs are totally banned items, the Division has never issued recommendation for import license. However, there may be POPs smuggled into Myanmar. Myanmar has no institutions that may regularly monitor the import into and use in Myanmar of POPs. Moreover, it would be more helpful if an advanced laboratory is established in the Ministry of Planning, Finance and Industry to make lab tests. It is also necessary to raise the capacity building of the personnel of the Division. If possible, it would be better to establish a chemical database so that online registration and online application will be much effective and faster.

The Ministry of Planning, Finance and Industry has a plan to form the Chemical Board of Inspection at the Union level and Region or State level. In Myanmar, there is no particular law relating to POPs, but, the notifications were issued under the provisions of the Prevention of Hazards from the Chemicals and Related Substances Law and its rules addressing the POPs. Whether or not a particular

law for POPs is necessary will also depend on the Environmental Conservation Department.

#### **2.2.3.8 The Pesticide Law**

The Pesticide Law was enacted in 1990 to regulate the import, export, sale, repacking, use and transport of pesticide. A Registration Board is formed by the Government, according to the section 3 of the Pesticide Law. Such Board directs the Myanmar Agriculture Service to analyse and test pesticides or any active ingredient received as samples as to conformity with the content of ingredient as claimed on the label; and to undertake bio-efficacy trials on crops for determining effectiveness in practical use. The Registration Board after evaluation of the applications for registration of formulated pesticides or active ingredients to be imported into the country may have the right either to accept or reject the applications. The Registration Board shall prohibit the use of any registered pesticide in the event that, inter alia, data, obtained either in Myanmar or abroad indicates that the pesticide is harmful to human beings, animals, crops and environment. POPs are also banned under that law.

#### **2.2.3.9 The Plant Pest Quarantine Law**

The Plant Pest Quarantine Law was enacted on 16<sup>th</sup> June 1993. According to section 4 of such law, it is provided that plant, plant product, pest, beneficial organism or soil (a) shall be imported by a person on application for an import certificate from the Myanmar Agriculture Service before obtaining license or permit from the department or organization concerned; (b) when on arrival by importing or when brought personally shall be subject to inspection by the Myanmar Agriculture Service; (c) shall be subject to payment of fees as prescribed for import certificate and to payment of inspection fees by the person who imports or brings along with him. The Plant Protection Division, Myanmar Agriculture Service, has a laboratory to inspect various kinds of pesticides, herbicides and so on. Such Division has issued notification and banned the import of POP.

Myanmar is not a POP producing country, but it is a user country. Though, various laws prohibit the import, export, use, transport of POPs and various implementing agencies issue notifications and directives not to import and use of POPs, there may probably illegal import and use of them, as mentioned by the officials of relevant ministries. The Plant Pest Quarantine Law addresses the prohibition of import, export, use of pesticide, herbicide that contains any POP. In the list of Banned Pesticides, it is found that following POPs are banned not to import or use in Myanmar. They are Alpha Hexachlorocyclohexane, Chlordecone, Endosulfan,

Heptachlor and Mirex. Dichlorodiphenyltrichloroethane (DDT), Endrin and Aldrin were also banned and they are no longer used as pesticides. However, there may be illegal imports of those banned chemicals.

#### 2.2.4 Relevant international commitments and obligations

Myanmar is a Party to the Stockholm Convention on Persistent Organic Pollutants. The Convention provides, in its preamble, inter alia, that the parties to the Convention recognize the important contribution that the private sector and non-governmental organizations play vital role in reduction and/or elimination of emission and discharge of persistent organic pollutants (POPs), underline the importance of manufacturer of POPs taking responsibility for reducing adverse effects caused by their products and for providing information to users, governments and public on the hazardous properties of those chemicals, conscious of the need to take measures to prevent adverse effects caused by persistent organic pollutants at all stages of their life cycle, reaffirm Principle 16 of the Rio Declaration on Environment and Development which states that national authorities should endeavour to promote the internationalization of environmental costs and the use of economic instruments taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and environment, encourage parties not having regulatory and assessment schemes for pesticides and industrial chemicals to develop such schemes, and determine to protect human health and the environment from the harmful impacts of persistent organic pollutants.

International conventions or regional agreements on environment which are ratified by Myanmar are stated in following table.

**Table 4. International conventions or regional agreements on environment which are ratified by Myanmar**

No.	Convention	Ratified	Entry into force
1.	United Nations Framework Convention on Climate Change (UNFCCC)	25-11-1994	23-2-1995
2.	Kyoto Protocol on Climate Change	13-8-2003 (Accession)	-
3.	Doha Amendment to the Kyoto Protocol on Climate Change	19-10-2017	-
4.	Paris Agreement on Climate Change	19-10-2017	-
5.	Vienna Convention for the Protection of the Ozone Layer	24-11-1993 (Accession)	22-2-1994

No.	Convention	Ratified	Entry into force
6.	Montreal Protocol on Substances that Deplete the Ozone Layer	24-11-1993 (Accession)	22-2-1994
7.	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	24-11-1993 (Accession)	22-2-1994
8.	Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	22-5-2009 (Accession)	-
9.	Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	30-1-2012 (Accession)	-
10.	Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	30-1-2012 (Accession)	-
11.	Stockholm Convention on Persistent Organic Pollutants	19-4-2004	18-7-2004
12.	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	6-1-2015	6-4-2015
13.	Convention on Biological Diversity	25-11-1994	-
14.	Cartagena Protocol on Biosafety	11-5-2001	-
15.	Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilization to the Convention on Biological Diversity	8-1-2014	-
16.	Convention on International Trade in Endangered Species of Wild Flora and Fauna-CITIES	13-6-1997 (Accession)	11-9-1997
17.	Convention to Combat Desertification	1-2-1997	-
18.	ASEAN Agreement on Transboundary Haze Pollution	5-3-2003	17-3-2003
19.	ASEAN Agreement on the conservation of Nature and Natural Resources, Kuala Lumpur	16-10-1997	-
20.	Plant Protection Agreement for the South-East Asia and the Pacific Region	4-11-1959	-

### 2.3 Assessment of POPs issues in the country

Assessment of current POPs management in Myanmar is based on inventories of: listed pesticides, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (POP-PBDEs), hexabromocyclododecane (HBCD), dichlorodiphenyl-

trichloroethane (DDT), perfluoro octane sulfonic acid (PFOS) and related substances, and unintentional production of POPs (UPOPs). These assessments are described in this section. This section also presents information on current POPs stockpiles, contaminated areas and waste, on remediation of contaminated areas, POPs levels in different environmental media, prediction of future POPs production, use and release, POPs monitoring in the Myanmar, as well as current information level, knowledge and education levels of each target group, and the mechanism for information exchange with other parties of the SC.

### **2.3.1 Assessment of POPs pesticides (Annex A of SC Text, Part I)**

#### **2.3.1.1 General**

POPs pesticides have largely been phased out with the exemptions of the use of Dichlorodiphenyltrichloroethane (DDT) for malaria control, endosulfan use as insecticide or PCP use in wood treatment of utility poles. However, in many parts of the world, poorly stored obsolete POPs-pesticides stocks and other hazardous pesticides in dumpsites, landfills, and warehouses await clean up and final disposal. The POPs pesticide management project in Africa revealed challenges and high cost for elimination of POPs pesticides in developing countries without own destruction capacity (IEG World Bank Group (2016)<sup>48</sup>. Even larger POPs stockpiles and wastes exist in Eastern Europe, the Caucasus and Central Asia (EECCA) countries with a total volume of 240,000 t.<sup>49</sup> The pesticide stockpiles in South-East Asian countries are considered lower, however for an agricultural Asian country like Vietnam an assessment has revealed more than 1000 potentially pesticides contaminated sites for this South East Asian agricultural country.

The chemicals in this category of POPs include: aldrin, chlordane, chlordecone, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex, and toxaphene. They are listed in Annex A of the SC Text along with the other POPs which are chemicals to be eliminated. DDT is listed in Annex B of the SC. Already in 1962, Rachel Carson questioned in her book *Silent Spring* the safety of DDT, heptachlor and other persistent chlorinated insecticides. All organochlorine POPs pesticides are lipophilic, bioaccumulate and are toxic to humans and wildlife.

Most of POPs pesticides have been substituted in the past 20 years by other pesticides. Often the alternatives pesticides used were not sufficiently assessed and

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<sup>48</sup> IEG World Bank Group (2016) Project Performance Assessment Report. Africa Stockpiles Programme. Ethiopia, Mali, Morocco, South Africa, Tanzania, Tunisia.

<sup>49</sup> Vijgen J, Aliyeva G, Weber R (2013) The Forum of the International HCH and Pesticides Association—a platform for international cooperation. *Env Sci Pollut Res.* 20, 2081-2086

frequently other highly hazardous pesticides (HHPs) have been introduced or pesticides with an impact on pollinators and ecosystem.<sup>50,51</sup>

### 2.3.1.2 Legislation

The New Pesticide Law of Myanmar was enacted in 2006. In Myanmar, there are 3801 pesticides registered at Pesticide Registration Board (PRB). Most of the pesticides are imported and some are produced in the country. In line with the Stockholm Convention, Myanmar has banned 41 pesticides including POPs pesticide highlighted in yellow colour shown in Table 5. Moreover, 7 pesticides restricted in Myanmar are shown in below Table 6.

**Table 5. List of banned pesticides in Myanmar (by notification no: 06/2018 of Pesticide Registration Board, 9<sup>th</sup> August 2018)**

No.	Pesticides	No.	Pesticides
1.	Aldicarb	21.	Ethylene Oxide
2.	Alachlor	22.	O-Ethyl-O-(4-nitrophenyl) phenylthiophosphonate (EPN)
3.	Aldrin	23.	Fluoroacetamide
4.	Alpha Hexachlorocyclohexane	24.	Heptachlor
5.	Arsenic Compound	25.	Hexachlorobenzene (HCB)
6.	Binapacryl	26.	Mercury compounds
7.	Beta Hexachlorocyclohexane	27.	Lindane (Gamma Hexachlorocyclohexane)
8.	Captafol	28.	Methomyl
9.	Chlordane	29.	Methamidophos
10.	Chlordimeform	30.	Monocrotophos
11.	Cyhexatin	31.	Mirex
12.	Chlordecone	32.	Methyl Parathion
13.	Chlorobenzilate	33.	Trichlorofon
14.	Dieldrin	34.	Parathion ethyl

<sup>50</sup> Rahman MM, Weber R, Tennekes H, Sanchez-Bayo F (2012) Substitutes of persistent organic pollutant (POP) pesticides in Bangladesh and the need for a sustainable substitution process. *Organohalogen Compounds* 74, 1178-1181 <http://www.dioxin20xx.org/wp-content/uploads/pdfs/2012/1302.pdf>

<sup>51</sup> Chagnon M, Kreutzweiser D, Mitchell EA, Morrissey CA, Noome DA, Van der Sluijs JP. *Environ Sci Pollut Res Int.* 2015 Jan;22(1):119-34. doi: 10.1007/s11356-014-3277-x. Epub 2014 Jul 19. Risks of large-scale use of systemic insecticides to ecosystem functioning and services.

No.	Pesticides	No.	Pesticides
15.	DNOC	35.	Pentachlorophenol (PCP)
16.	Dinoseb	36.	Phosphamidon
17.	Ethylene Dibromide (EDB)	37.	Strobane (Polychloroterpenes)
18.	Ethylene Dichloride	38.	2,4,5-T and 2,4,5-TP
19.	Endrin	39.	Toxaphene
20.	Endosulfan	40.	Tributyltin
		41.	DDT (Dichloro-diphenyl-trichloroethane)

Source: Appendix (III) Presentation of Pesticide Analytical laboratory, PPD

**Table 6. List of restricted pesticides (by notification no: 5/2018 of Pesticide Registration Board, 9<sup>th</sup> August 2018)**

No.	Pesticide	Remarks
1.	Methyl Bromide	Fumigant to be handled only by CPA holders.
2.	Aluminium Phosphine	Fumigant to be handled only by CPA holders.
3.	Bromadiolone	Rodenticide ai. to be handled only by certified formulator.
4.	Zinc Phosphide	Rodenticide ai. to be handled only by certified formulator
5.	Brodifacoum	Rodenticide ai.to be handled only by certified formulator
6.	Fenthion	Restricted to vector control.
7.	Magnesium Phosphine	Fumigant to be handled only by CPA holders.

### 2.3.1.3 Production

There are five pesticide formulation plants in Myanmar. Three are neem formulation plants in Magway, Paleik and Pakokku. A pilot pesticide formulation plant in Hmawbi was established by UNIDO Aid in 1990.

Myanmar has operated a production of endosulfan 35EC in the HmawBi pesticide production and formulation plant, from 1990 to 1998. The total production volume is shown in

Table 7. Production of endosulfan 35EC in pilot pesticide formulation plant, **HmawBi**. Registered Technical Grades are imported and formulated in that plant. The pesticides formulation in Hmawbi Pesticide Formulation Plant and Neem Pesticide Production in Myanmar are shown in

Table 8. Pesticide formulation in Hmawbi pesticide formulation **plant** and Table 9. Neem pesticide production in Myanmar below.

**Table 7. Production of endosulfan 35EC in pilot pesticide formulation plant, HmawBi**

No.	Year	Production of Endosulfan 35EC (Liter)
1.	1990-91	45666
2.	1991-92	128364
3.	1992-93	31884
4.	1993-94	41827
5.	1994-95	45325
6.	1995-96	39155
7.	1996-97	51470
8.	1997-98	25720
<b>Total</b>		<b>409,411 Liters (368 MT)</b>

Source: Appendix (III) Presentation of Pesticide Analytical laboratory, PPD

**Table 8. Pesticide formulation in Hmawbi pesticide formulation plant**

No.	Name of Insecticide	1995-96	1996-97	1997-98	1998-99	1999-2000
		Liter	Liter	Liter	Liter	Liter
1.	Fenitrothion 50%EC	110150	101812	16930	130000	155000
2.	Phenthoate 50 %EC	40182	90011	87620	100000	95000
3.	Endosulfan 35%EC	39155	51470	52720	100000	105000
4.	Cypermethrin10%EC	138458	82135	54040	150000	150000
5.	Diazinon 40%EC	71992	80485	58780	100000	150000
6.	Deltamethrin 2.5%EC	-	20560	-	-	10000
7.	Permethrin 20 %EC	-	14400	-	-	-
8.	Sumialpha 5%EC	-	55210	47210	50000	35000
9.	Malthion 50%EC	-	-	-	70000	-
<b>Total</b>		<b>399937</b>	<b>496083</b>	<b>281300</b>	<b>700000</b>	<b>700000</b>

Note: After year 2000, pesticide production is stopped due to mechanical failure.

**Table 9. Neem pesticide production in Myanmar**

No.	Year	Production of formulation (Liter) 0.75%SC (Suspension Concentrate)
1.	1994-95	6189
2.	1995-96	11745
3.	1996-97	15931
4.	1997-98	11647
5.	1998-99	16000
6.	1999-2000	24000
7.	2000-01	47301.9
8.	2001-02	26344.36
9.	2002-03	3765.8
10.	2003-04	7808

Source: Table (4.9) and (4.10) from page 121 of Reference No. (24)

#### 2.3.1.4 Import

No POPs pesticides are imported to Myanmar. However, Myanmar, being an agriculture country, it is deemed that the pesticide use cannot be abandoned for agriculture production for a foreseeable future. The pesticide import has increased in recent years.

To reduce the use of pesticides, Integrated Pest Management (IPM) packages by crops have been developed in cotton, rice, pulses and some vegetable with strong emphasis on less use of pesticides.

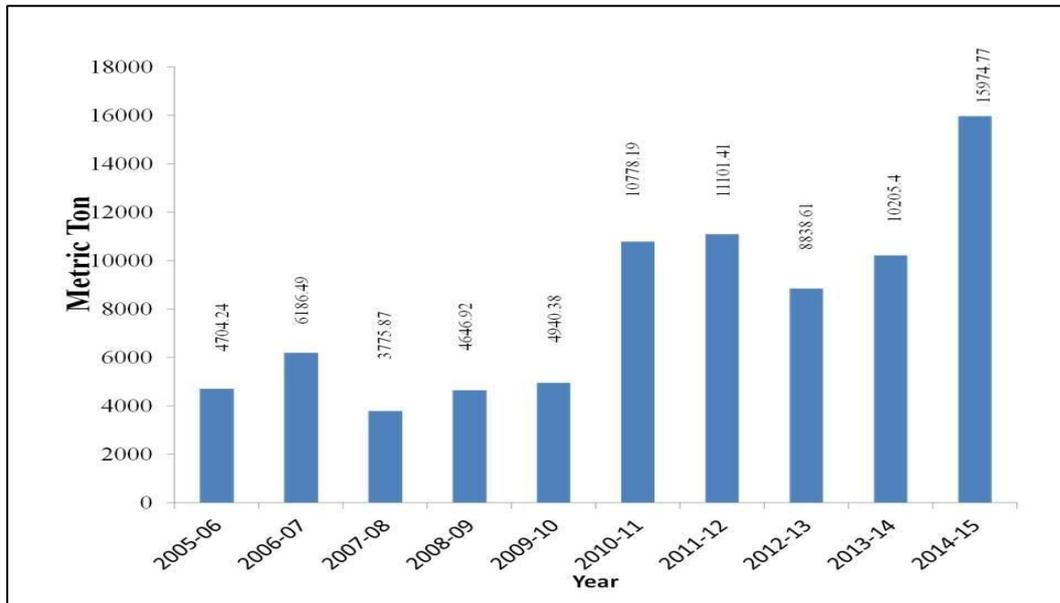
Pesticide can cause not only human health and environmental problems but also can have negative impact on the economy of an agriculture exporting country. Though an acute poisoning of these chemicals is observed, there seems to be less knowledge about the chronic aspects and current awareness service is urgently needed for both producers and consumers in food safety aspect.

Pesticide Registration Board (PRB) of Myanmar recognizes the depth and wideness of the scope of the subject of Pesticide Management and calls for better co-operation with farmers for the sound and effective use of pesticides for clean and green agriculture.

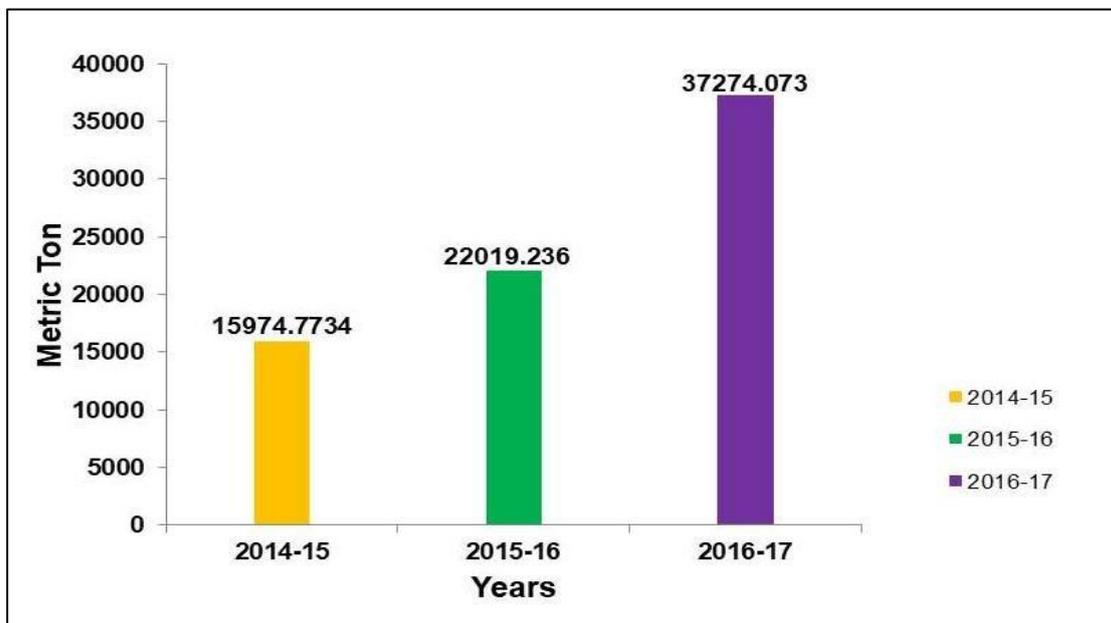
Regarding importation and distribution, the secretary of PRB endorses the import application after inspecting the quality for the import permit. A small proportion of the pesticides sold is locally formulated or repackaged and most are

imported as ready-to-use packages. The Plant Protection Division (PPD) check that the product concerned is registered and requires a sample for quality monitoring prior to endorsement for import.

Pesticides are only imported by private companies and total imports of pesticides from 2005 to 2015 and from 2015 to 2017 are shown in following Figure respectively.



**Figure 9. Import of pesticide from 2005 to 2015**



Source: Appendix (III) Presentation of Pesticide Analytical laboratory, PPD

**Figure 10. Import of pesticides from 2015 to 2017**

Technical endosulfan is listed under the Annex A of SC Text but there are specific exemptions for use on some crop-pests. Import of endosulfan 35 EC from 1995 to 2008 and import of Endosulfan 96%TG from 1995 to 2008 are shown in following table.

**Table 10. Import of endosulfan 35 EC from 1995 to 2008**

No.	Year	Import of Endosulfan 35 EC (t)
1.	1995	39.15
2.	1996	51.47
3.	1997	25.72
4.	2001	34.00
5.	2003	90.00
<b>Total</b>		<b>240.34 (MT)</b>
No.	Year	Import of Endosulfan 96%TG (t)
6.	2003	8.40
7.	2004	30.00
8.	2005	12.60
9.	2006	21.00
10.	2007	38.90
11.	2008	21.00
<b>Total</b>		<b>131.90 (MT)</b>

Source: Appendix (III) Presentation of Pesticide Analytical laboratory, PPD

### 2.3.1.5 Export

No export of POPs pesticides has been identified.

### 2.3.1.6 Registration

For the purpose of scrutinizing the efficacy of pesticides to be approved for use, minimizing hazards to human health and environment, promoting safe and effective use of pesticides, and assurance of registration, the Republic of the Union of Myanmar formed the Pesticide Registration Board (PRB) constituted with 15 competent authorities from relevant Ministries in 2017.

Duties and Powers of Pesticide Registration Board (PRB) are as follows;

- (1) The Registration Board shall direct the Department of Agriculture to analyze and test any pesticide or active ingredient submitted with registration form to confirm the content of ingredient as claimed on the label and to undertake bio-efficacy trial on crop-pest for determining effectiveness in practical use.
- (2) The Registration Board may issue any relevant registration certificate if it is qualified and effective in accordance with the laboratory test and bio-efficacy trial on crop-pest soil conducted by Department of Agriculture. Registration Board may issue special use permit as emergency use for applying any pesticide considered inevitable for the control and prevention of occurrence of any unexpected pesticide incidence.
- (3) The Registration Board shall prohibit the use of any registered pesticide or the registration may be withdrawn in the event of non-compliance with pesticide law.
- (4) Registration Board, based upon international recommendation may issue safety guideline in the manufacturer, handling, use, transportation, storage and sell of pesticide, disposal of expired pesticide which poses a threat to all living organisms and the environment, systematic disposal and destruction of pesticide containers and packaging materials.
- (5) Registration Board may allow the Department of Agriculture to seek advice from specialists concerning analysis of pesticide and bio-efficacy trials on cultivated crops as required.
- (6) The Registration Board shall treat the data submitted for foreign or local pesticide products or active ingredients as confidential proprietary data.
- (7) The Registration Board:
  - (a) shall constitute the technical committee with the Director General as the chairperson, the Director of the Plant Protection Division as secretary and the technical experts from the relevant department with the approval of the ministry and specifies its duties.
  - (b) shall organize the technical committee from time to time with the approval of the Ministry.
  - (c) shall establish necessary working groups to be able to effectively carry out their duties and support the pesticide technical committee.

Any person desirous of importing formulated pesticides and active ingredients must have one of the following registrations / use permit. An application in the prescribed form shall be submitted to the Registration Board;

- (1) Experimental registration;
- (2) Provisional registration;
- (3) Full registration;
- (4) Special use permit.

A person desirous of engaging in whole/retail sale of pesticide shall for the purpose of obtaining a license, apply to the District Officer of Department of Agriculture. Pesticide retailers need a license from the district officer of DOA. In order to get the license, they must have completed Certified Pesticide Applicator (CPA) training.

The Pesticide Registration Board (PRB) had already issued the following types of Registration Certificate and License;

- (1) Registration Certificate and License
  - (a) Experimental registration – 371
  - (b) Provisional Registration – 2439
  - (c) Full Registration - 991
- (2) Formulator License - 17
- (3) Fumigation License - 31
- (4) Retail Sale License - 418

The Pesticide Law also prescribed the conditions for compliance by the pesticide importer, license holder and user. A safety guideline for pesticide formulation, repacking and storage is published.

#### **2.3.1.7 Release**

Currently there are no releases of POPs pesticides since no POPs pesticides are used and the few stocks are appropriately contained.

#### **2.3.1.8 Use**

POPs pesticides are not used in Myanmar anymore. The former use has stopped with the last use of endosulfan and dichlorodiphenyltrichloroethane (DDT) more than 5 years ago. Some pesticides are illegally smuggled into the country and some counterfeit pesticides might be sold in the country as have also discovered for

other countries<sup>52</sup>. It cannot be excluded that some POPs pesticides might enter the country via these two routes.

Overall the utilization of pesticides and fertilizers in Myanmar is low compared to neighbouring countries. However, the use of pesticides has increased in recent years and it is expected to further increase with the change of cropping pattern aimed at increased rice production and the expansion of various crop growing areas.

Information on utilization of POPs pesticides in agricultural sector in Myanmar from PPD of DOA were summarized in the following table.

**Table 11. Former utilization of POPs pesticides in agricultural sector**

No.	POPs Pesticides	Utilization
1.	Aldrin	Formerly used to control red ants, soil pest especially on peas and beans and oil seed crops.
2.	Chlordane	No importation
3.	Dieldrin	No importation
4.	Endrin	Former use soil pests, oil seed crops
5.	Endosulfan	Former use of many varieties of agricultural crops

### 2.3.1.9 Future use of POPs pesticides

There is no plan of future use of POPs pesticides in Myanmar.

#### 2.3.1.10 Storage

According to information received from inventory task team, dichlorodiphenyltrichloroethane (DDT) stockpile are stored in separate room safely.

<sup>52</sup> Miszczyk et al. (2018) Official control of plant protection products in Poland: detection of illegal products. Environmental Science and Pollution Research. <https://doi.org/10.1007/s11356-018-1739-2>



**Figure 11. Current storage condition of DDT stockpiles in Myanmar management of POPs pesticides**

The remaining pesticide stocks will need to be managed in an environmentally sound manner and this activity is a part of the action plan.

#### **2.3.1.11 Disposal of POPs pesticides**

There was no specific disposal of POPs pesticides in the past. The remaining stocks of dichlorodiphenyltrichloroethane (DDT) will be disposed in future in an environmentally sound manner (see action plan).

#### **2.3.1.12 Potential impacts of POPs pesticides**

In 2003 a general survey was conducted in 16 States and Divisions hospitals. The data on poisoning status of the hospitalized cases and the residues survey in food commodities and violation of Maximum Residue Limits (MRLs) (1989 - 2005) are shown in tables 11-12 below.

**Table 12. Distribution of the acute pesticide poisoning cases by type in 2003**

No.	Type	ICD 10 Code No.	Cases	Death
1.	Organophosphates	X48, X68, Y18	216	23
2.	Cypermethrin (Pyrethroid)	X48, X68, Y18	9	2
3.	Insecticide (unsp)	X48, X68, Y18	89	9
4.	Rodenticide (unsp)	X48, X68, Y18	82	6
5.	Pesticide (unsp)	X48, X68, Y18	9	3

No.	Type	ICD 10 Code No.	Cases	Death
6.	Herbicide (unsp)	X48, X68, Y18	3	-
7.	Endosulfan (Organochlorine)	X48, X68, Y18	3	-
8.	Carbamate (unsp )	X48, X68, Y18	1	-
9.	Metadelphene(Repito)	X48, X68, Y18	1	-
<b>Total</b>			<b>413</b>	<b>43</b>
<b>%</b>			<b>32.8</b>	<b>86.3</b>

Source: Food and Agricultural Organization in Myanmar

**Table 13. Distribution of the acute organophosphorus pesticide poisoning cases by category in 2003**

No.	Type	ICD 10 Code No.	Cases	Death
1.	Malathion	X48, X68, Y18	132	12
2.	Fenitrothion	X48, X68, Y18	4	1
3.	Monocrptophos	X48, X68, Y18	2	-
4.	Organophosphorous (unsp)	X48, X68, Y18	78	10
<b>Total</b>			<b>216</b>	<b>23</b>
<b>%</b>			<b>17.3</b>	<b>36.5</b>

Note: unsp = unspecified poisoning

Source: Food and Agricultural Organization in Myanmar

**Table 14. Residues survey in food commodities and violation of MRL's (1989 - 2005)**

No.	Year	No. of sample Analyzed (Food)	Sample violating Codex Limits %	Detected Residue Level
1.	1989-90	190	44 (23%)	DDT 0.3-0.4 Aldrin + Dieldrin 0.1-0.2
2.	1990-91	244	45 (18%)	DDT 0.2-1.0 Aldrin + Dieldrin 0.2-1.3
3.	1991-92	51	0	0
4.	1992-93	49	3 (6%)	DDT 0.03-0.2 Aldrin + Dieldrin 0.01-0.06

No.	Year	No. of sample Analyzed (Food)	Sample violating Codex Limits %	Detected Residue Level
5.	1993-94	115	15 (13%)	DDT 0.01-0.05 Aldrin + Dieldrin 0.01-0.05
6.	1994-95	44	7 (16%)	DDT 0.15-0.2 Aldrin + Dieldrin 0.01-0.02
7.	1995-96	60	0	0
8.	1996-97	40	2 (5%)	DDT 0.05 Aldrin + Dieldrin 0.03
9.	1997-98	36	0	OCI detected < LD
10.	1998-99	159	0	OCI detected < LD
11.	1999-2000	66	0	0
12.	2000-01	83	0	0
13.	2001-02	81	0	0
14.	2002-03	27	0	0
15.	2003-04	49	0	0
16.	2004-05	46	0	0

Source: Table (4.1), (4.2) and (4.3) from page 119 to 120 of Reference No. (24)

Note: LD = Limit of Detection

The survey on use of POPs pesticides in the agriculture area was conducted for many years. Monitoring attempt was conducted to compare residue level in an agricultural region and with that in a non-agricultural region. Number of environmental samples analysed and level of pesticides detected in parts per million (ppm) are shown in table 14 below.

**Table 15. Environmental samples analysed and level of pesticides detected (in PPM)**

No.	Type of Sample	Agriculture Area			Non-agriculture Area		
		Aldrin	Dieldrin	DDT	Aldrin	Dieldrin	DDT
1.	Water Weed	0.05	-	-	0.008	-	-
2.	Soil	0.02	0.01	-	-	0.004	0.02
3.	Water	0.0002	-	-	-	-	-

Source: Appendix (III) Presentation of Pesticide Analytical laboratory, PPD

## **2.3.2 Assessment of PCBs (Annex A of SC Text, Part II) and PCNs (Annex A of SC Text, Part I)**

### **2.3.2.1 General**

PCB's are man-made chemicals; they are not flammable, have high electrical resistance, and possess good insulating properties.

PCBs were widely used for many applications, especially as dielectric fluids in transformers, capacitors, and coolants but also in open applications like sealants, paints, plastic additives, or non-carbon copy paper. PCBs are carcinogens (category 1) and some congeners have dioxin-like activity. Further toxic effects associated with PCB congeners are endocrine disruption and neurotoxicity. Approximately 1.3 to 2 million tonnes of PCBs was manufactured over the period from 1930 to 1993, half of which were produced by Monsanto mainly in the United States of America. In recent global inventory it was estimated that approx. 14 million tons of contaminated equipment (transformer, capacitor) and contaminated oils exist.<sup>53</sup> With treatment costs of USD 1,000 to 5000 per ton<sup>54</sup> (including packing, transport, and destruction), this would amount to an estimated global management cost of USD 14 to 70 billions to manage the remaining equipment and contaminated oil.

PCNs are man-made chemicals; they are not flammable, have high electrical resistance, and possess good insulating properties.

PCNs have been used in the same applications as PCBs including closed applications (capacitors, transformers) and open applications (e.g. paints, coatings, sealants, flame retardants in cables)<sup>55</sup>. However, PCNs were mainly produced/ used from 1930 to 1960 with lower productions in the 1970s and production was stopped around 2000. Furthermore, the historic production volume was only about 10% of PCBs. PCNs are present in technical PCBs as unintentional POPs.

Therefore, stocks and waste of PCNs can be addressed within the management of PCBs and therefore are addressed together with PCBs here. Also the Basel Convention has included PCNs into the technical guidelines for managing PCBs.<sup>56</sup> While the low POPs content for PCBs has been set at 50 mg/kg, the low POPs content for PCNs were set at 10 mg/kg which need to be considered in the management.

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<sup>53</sup> UNEP (2016) Consolidated Assessment of Efforts made towards the elimination of polychlorinated biphenyls. UNEP/DTIE CHEMICALS AND WASTE BRANCH, January 2016

<sup>54</sup> Stockholm Convention (2010) PCB Elimination Network Magazine, Issue 1, pp. 12 (12/2010).

<sup>55</sup> Secretariat of the Stockholm Convention (2017) Draft guidance on preparing inventories of polychlorinated naphthalenes (PCNs). Draft March 2017. UNEP/POPS/COP.8/INF/19

<sup>56</sup> UNEP (2017b) Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls, polychlorinated terphenyls, polychlorinated naphthalenes or polybrominated biphenyls including hexabromobiphenyl. UNEP/CHW.13/6/Add.4.

In Myanmar, the Ministry of Planning Finance and Industry enacted the Prevention of Hazard from Chemicals and Related Substances Law on 26th August 2013 and its Rules on 12th January 2016. And then, the Notification of 65 Prohibited Chemicals issued by above rules. These Prohibited Chemicals contains 28 POPs including PCBs. Therefore, no one is allowed to import, produce or use PCBs. Besides, Ministry of Natural Resources and Environmental Conservation promulgated the Environmental Conservation Law on 3rd March 2012 and Rules on 6th June 2015. According to this law, handling, using, manufacturing, storage and disposing of environmental pollutant chemicals which can damage the environment and living things were prohibited.

### **2.3.2.2 Import**

According to the information provided by the Custom Department, a total number of 20287 transformers have been imported to Myanmar up to July 2016, containing approx. 14,265,770 kg (14265.8 tonnes) of transformer oil.

Also, according to the Trade Department, six companies imported 923 tonnes of transformer oil from April 2016 to September 2016 and twenty-three companies imported 780 transformers (above 33 KV), from April 2015 to September 2016 by sea route. Twenty companies imported 56 transformers which are above 33 KV by border trade.

The recently imported transformers likely do not contain PCBs. However, there is no specific monitoring of the oil content.

### **2.3.2.3 Export**

In Myanmar, one company named Soe Electric and Machinery Co. Ltd., has been producing transformers. There was no export of PCB containing transformers.

### **2.3.2.4 Use of transformers and other equipment**

A first PCB inventory was conducted by collecting transformer oil samples in transformers from 5 Regions, 3 States and Nay Pyi Taw in 2016 and 2017 with random sampling.

The PCB inventory task team went to 8 townships in Yangon, 36 townships in Mandalay, 15 townships in Bago (East), 16 townships in Bago (West), 10 townships in Magway, 6 townships in Sagaing Region, 11 places in Eastern Shan State, 7 places in Kayah State and 1 township in Mon State and 2 township in Nay Pyi Taw. Total

estimated no. of transformers (230 KV, 132 KV, 66 KV, 33 KV, 11 KV, 6.6 KV, 0.4 KV) in the whole Myanmar are 46038.

Among them, 592 transformers which account for 1.3 % of the whole Myanmar were inspected by the PCB task team in this first NIP development and analyzed by L2000DX PCB analyser for chlorine content. The results indicated that 119 transformers out of the 592 transformers are more than 50 ppm of Stockholm Convention chlorine content. The highest level detected were below 1000 ppm. Only a waste oil tank contained 2000 ppm.

Moreover, the PCB inventory task team received information that out of the 119 contaminated transformers only 9 transformers are at storage site, the other 110 are currently in use.

The estimated amount of transformer oils which might be contaminated with PCB is 319,224 kg which account for 13 % of total amount of inventoried transformer oil of 2,371,018 kg (~2300 tonnes).

However as most of the chlorine tests indicate that chlorine levels between 50 and 200 ppm and since from similar PCB projects it is known that a considerable share of these chlorine tested samples show false positive results (up to 80%) it is estimated that approx. 1000 to 3000 transformers (of the total 46000 transformers) contain PCB contaminated oil. With an average estimated weight of 1 tonne, this translates to approx. 1000 to 3000 t of PCB contaminated oil and equipment.



**Figure 12. PCB inventory activities**

**Table 16. Summary of PCB inventory in Myanmar**

No.	Division/ State	Total Transformer in whole Myanmar								Inventoried Transformer					
		230 KV	132 KV	66 KV	33 KV	11 KV	6.6 KV	0.4 KV	No. of Actual Total Transformer	Total No. of Transformer (230, 132, 66, 33, 11, 6.6, 0.4 KV)	No. of transformer without PCB	No. of transformer contaminated with PCB	Total Amount of Inventoried Transformer oil (kg)	Amount of transformer oil without PCB (kg)	Amount of PCB contaminated transformer oil (kg)
1.	Yangon	9	-	34	750	9083	3482	-	<b>13358</b>	113	85	28	663935	515731	<b>148204</b>
2.	Mandalay	6	11	21	578	7620	52	-	<b>8288</b>	136	98	38	262208	192828	69380
3.	Bago	-	-	20	103	3815	27	-	<b>3965</b>	148	117	31	648507	614977	33530
4.	Mon	-	-	10	91	1704	28	-	<b>1833</b>	10	10	-	30446	30446	-
5.	Kayah	-	-	3	33	651	-	-	<b>687</b>	28	23	5	157313	149829	7484
6.	Shan	-	-	52	101	3504	4	6	<b>3667</b>	76	74	2	186758	186243	515
7.	Sagaing	-	-	15	248	3151	44	7	<b>3465</b>	31	27	4	233818	211248	22570
8.	Kachin	-	-	15	57	1180	-	-	<b>1252</b>	-	-	-	-	-	-
9.	Nay Pyi Taw	-	-	-	90	2653	9	-	<b>2752</b>	26	23	3	92453	86859	5594
10.	Kayin	-	-	7	5	587	-	-	<b>599</b>	-	-	-	-	-	-
11.	Chin	-	-	4		263	-	-	<b>267</b>	-	-	-	-	-	-
12.	Ayeyarwaddy	-	-	34	92	2029	9	-	<b>2164</b>	-	-	-	-	-	-
13.	Tanintharye	-	-	4	4	464	9	-	<b>481</b>	-	-	-	-	-	-
14.	Rakhine	-	-	17	7	1071	-	-	<b>1095</b>	-	-	-	-	-	-
15.	Magwae	-	-	63	48	1987	5	-	<b>2103</b>	24	16	8	95580	63633	31947
<b>Total</b>		<b>53</b>	<b>35</b>	<b>299</b>	<b>2207</b>	<b>39762</b>	<b>3669</b>	<b>13</b>	<b>46038</b>	<b>592</b>	<b>473</b>	<b>119</b>	<b>2371018</b>	<b>2051794</b>	<b>319224</b>
<b>Percent</b>		<b>100%</b>								<b>1.3%</b>			100%	87%	13%

### **2.3.2.5 Registration and control**

During the period 2005 - 2016, according to information from DISI under Ministry of Planning Finance and Industry, the number of Power Sub-stations registered was 23,176. Moreover, there are 4 large transformer manufacturing companies in Yangon which have been registered to MOPFI since 2001.

### **2.3.2.6 Storage and release**

In Myanmar, there are temporary maintenance sites in most of the Regions and States where old transformers are repaired and reused. Moreover, PCB task team found that there are three main storage sites; one is for old transformers storage site in Lawpita, Kayar State and the other two are Hong Hai Sub-station and 24 Hours Distribution & Maintenance Department which can be found as transformers storage sites at Bottom Kyiemyinttai Road, Ahlone Township in Yangon Region under YESC (Yangon Electricity Supply Corporation). Therefore, Lawpita dump site, Hong Hai Substation and 24 Hours Distribution and Maintenance Department can be found as transformer disposal site in Myanmar. Currently only 9 PCB contaminated transformers are stored in these three storage sites awaiting their future disposal (see action plan).

### **2.3.2.7 Potential impacts**

In this first inventory activities, no PCB measurement of environmental samples or assessment of workers have been conducted due to the lack of capacity of PCB analysis.

The inventory and workshop activities awareness have been raised on the risk of PCBs. This reduces the risk of current and future impacts.

## **2.3.3 Assessment of PBDEs (Annex A of SC Text, Part IV & Part V), HBB (Annex A of SC Text, Part I)**

### **2.3.3.1 General**

In order to develop national implementation plan (NIP), an inventory of commercial PentaBDE, commercial OctaBDE, their current use, initial flow, and disposal have been conducted in Myanmar based on the PBDE inventory guidance documents.

Polybrominated diphenyl ethers (PBDEs) are brominated flame retardants (BFRs) used in various products such as plastic in electronics, polyurethane foams in vehicles, and textiles, to reduce their ignitability to meet certain flammability standards. Due to the increase of flammable polymer materials, the global demand for PBDEs (and other flame retardants) has been growing rapidly from the 1970s to 1990s. Three commercial PBDE mixtures were produced and used in the market: commercial PentaBDE, OctaBDE and

DecaBDE. However, due to their characteristics of persistence, bioaccumulation potential, long-range environmental transport and adverse effects on wildlife and humans, PBDEs have become ubiquitous environmental contaminants and aroused increasing concern. Appreciable levels of PBDEs have been reported in various environmental media and biota, including air, soil, marine mammals and human blood. PBDEs can affect neurodevelopment, neurobehavioral and thyroid hormone regulation in exposed animals and individuals.

Due to the environmental and health risk, commercial PentaBDE (c-PentaBDE) and commercial OctaBDE (c-OctaBDE) technical mixtures production stopped in 2004. Plastics are important parts of electrical and electronic equipment (EEE) products and PBDEs are widely used as additives in these plastics.

The challenge is how to practically control PBDE in articles and the recycling flows. This is in particular a problem for developing countries like Myanmar where state of the art recycling plants with monitoring capacity do not exist and measurement capacity is not established. Myanmar (like other developing countries) lack appropriate recycling and destruction facilities which leads to open burning or dumping of such hazardous wastes or release to water bodies causing environmental pollution including marine litter.

For c-PentaBDE the main use 90% was in polyurethane foam with use in car/transport, furniture, construction, or baby products with the major use in the US.

The aim of this inventory was to evaluate the situation in Myanmar of the major articles and products in use and stocks and wastes impacted with POP-PBDEs. For PBDEs the inventory mainly focused on electrical and electronic equipment (EEE) and related waste (WEEE) and the transport sector.

The methodology used to carry out the inventory was based on the Stockholm Convention inventory guidance document. Methods used were survey, the use of data of the official statistics (e.g. from Ministry of Commerce or Custom Department).

### **2.3.3.2 EEE and WEEE containing POP-PBDEs**

Plastic in certain electrical and electronic equipment (EEE) and related waste (WEEE) in particular Cathode Ray Tube (CRT) casings is considered to contain the largest share of POP-PBDEs.

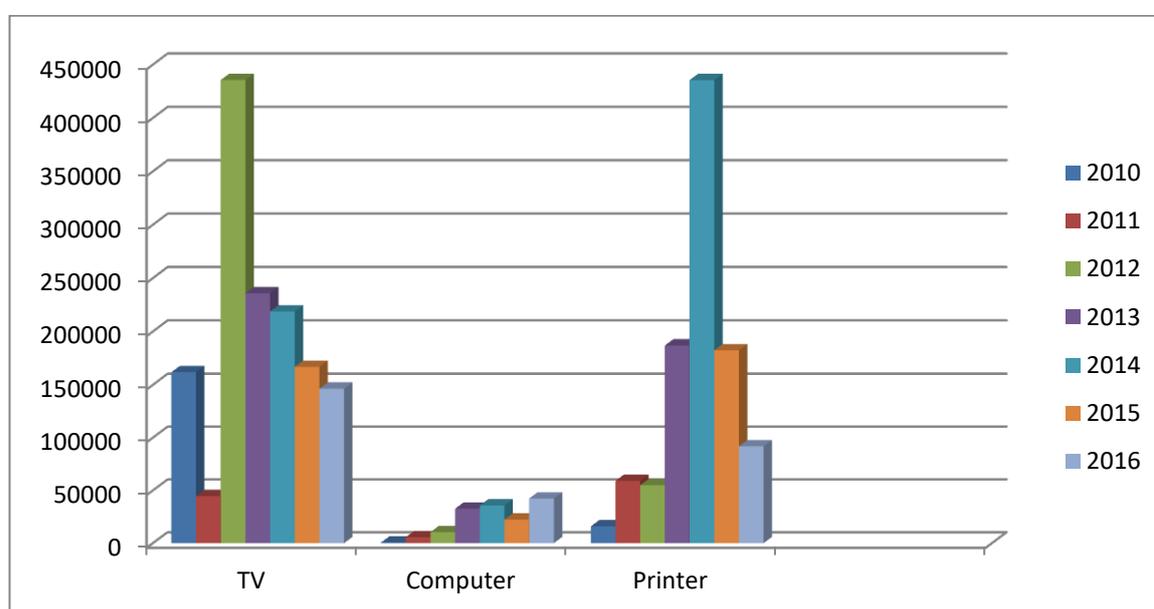
c-DecaBDE has been listed in 2017 as POPs and due to the recent listing was not part of this inventory. Due to the considerable larger amount of DecaBDE use in CRTs and also in other EEE plastic, the actual amount of total Polybrominated diphenyl ethers (PBDE) is considerable larger than the current estimated POP-PBDE from c-OctaBDE. Since no inventory guidance is available yet, it can currently not be calculated how much DecaBDE is in the EEE/WEEE plastic. Since the DecaBDE use was approx. 10 times the

c-OctaBDE use, the total amount might be an order of magnitude higher. Since DecaBDE is still produced and has also been used more recently than c-OctaBDE, more recent equipment is impacted by DecaBDE.

The evaluation of available and relevant national data on the selected sectors was conducted using the tiered approach suggested by the Stockholm Convention PBDE Inventory Guidance with the collected available data.

### 2.3.3.2.1 Import and export

The import and use of electronics to Myanmar has considerably increased in recent years. For personal computers (PCs) in imports, the PBDE content was estimated for the years 2010 to 2016.



**Figure 13. Imported TVs, computers and printers 2010 to 2016 (Data of Ministry of Commerce)**

There was no particular information on e-waste exports. E-waste management need to be established firstly and then appropriate treatment, recycling and possibly export options need to be evaluated.

**Table 17. Estimated amount of PBDEs and polymers in imported PCs**

Year	PCs imported	Weight (ton)	Polymer content (ton)	c-OctBDE range (Kg)	HeptaBDE range (Kg)	HexaBDE range (Kg)
2010	658	16.45	4.935	4.3-12.5349	1.85-5.39	0.473-1.38

Year	PCs imported	Weight (ton)	Polymer content (ton)	c-OctBDE range (Kg)	HeptaBDE range (Kg)	HexaBDE range (Kg)
2011	5653	141.325	42.4	36.9-107.7	15.87-46.31	4.06-11.85
2012	10488	262.2	78.66	68.43-200	29.42-86	7.53-22.0
2013	32692	817.3	245.2	213.3-622.81	91.72-267.81	23.46-68.51
2014	35764	894.1	268.23	233.36-681.3	100.34-293	25.67-75
2015	22349	558.73	167.62	145.83-425.75	62.71-183.1	16.04-46.83
2016	42287	1057.2	317.15	276-805.57	118.68-346.4	30.36-88.61

### 2.3.3.2.2 Current use / storage

There is a considerable increase in electronics in the last decade in Myanmar. E.g. the total number of PCs in use in the household sector for the years 2010 and 2016 were 658 and 42287 respectively.

The amount of cathode ray tube (CRTs) in Myanmar was estimated via an estimated penetration rate of 0.08 CRT/person. With a total population of 52.9 million (2016), the total number of CRTs were estimated to 423200 with a total weight of 10580 tonnes. Out of the total weight of CRTs in use/stored in households the polymer fraction 30% is 3174 tonnes.

The Polybrominated diphenyl ethers (PBDE) inventory of EEE/WEEE focused on the CRTs of TVs and PCs as the main POP-PBDE containing material flow.

With an average c-OctaBDE content of 0.87 to 2.54 kg/tonne of polymer fraction, the total amount of c-OctaBDE in the number of 423,200 CRTs is estimated between 2761 to 8062 kg.

The POP-PBDE content (HexaBDE + HeptaBDE) amount is estimated between 1491 kg to 4354 kg.

In addition, the PBDE inventory activities have been used to start to establish an initial basis for an overall inventory of electronics in Myanmar. For example, a first survey of 79 households has been conducted and the presence of electronic equipment are assessed.

An X-ray fluorescence (XRF) equipment have been purchased and initial screening of bromine and heavy metals with the XRF has been conducted. The XRF technology can be used for detection and separation of bromine-containing polymers with a detection limit of 10 ppm to 100 ppm. XRF analysis is limited to the detection of bromine in the material, without capacity to identify the type of BFR compound. Six of the seventeen tested plastic of electronics contained bromine but none of them in concentrations above 1.5%.

Therefore, the detected bromine concentration did not result from intentional addition but from recycling of BFR containing plastic. All measured concentrations of elements were below the European Regulation for Hazardous Substances (RoHS).

### Large Household Appliances (Category 1)



**Figure 14. Share of large household appliances (category 1) in a survey of 79 households**

**Table 18. Initial screening of bromine, lead, cadmium, chromium and arsenic in selected electronics**

No.	Electronic Items	Element Content				
		Chromium (ppm)	Arsenic (ppm)	Bromine (ppm)	Lead (ppm)	Cadmium (ppm)
1.	Philips Iron	0.3840	0.1244	0.0	0.0	0.0
2.	Sharp LCD TV	2.9186	0.2408	0.0	1.1451	0.0
3.	Sony LCD TV	0.0	0.1926	63.9532	1.4757	0.0
4.	Misushita hot plate	55.1830	5.4727	2204.7373	8.5482	0.6349
5.	Misushita rice cooker	161.3587	135.8928	0.0	773.4077	19.7964
6.	Media hot plate	32.2103	1.7283	1114.2033	5.3273	6.4190
7.	Media refrigerator	0.0	0.0040	0.0	0.0	2.0889
8.	HP Laptop	3.4563	0.0	0.0	0.0	0.0
9.	LG Refrigerator	6.7589	0.0107	0.0	0.0	0.0
10.	KHNE rice cooker	5.2996	0.0	0.0	0.0	0.0

No.	Electronic Items	Element Content				
		Chromium (ppm)	Arsenic (ppm)	Bromine (ppm)	Lead (ppm)	Cadmium (ppm)
11.	HDTV LCD	5.0692	18.8341	10920.1977	34.6786	1.4032
12.	Dell Laptop	0.6913	0.1498	0.0	0.4348	0.0
13.	Hisense Refrigerator	0.0	0.4	0.0	3.6985	2.1714
14.	Acer Laptop	0.0	0.0067	0.0	0.0	0.4381
15.	Kettle	0.4608	13.5085	1.6811	63.3632	0.0
16.	DVD player	43.6564	1.5838	2056.2440	5.2889	6.3744
17.	DVD player	23.1018	8.8928	1565.6037	95.3126	0.0

### 2.3.3.2.3 End-of-life

In Myanmar, there is an active informal sector with an established network for collection of end-of-life products and their recycling, particularly repair, refurbishment and parts harvesting. The residues left after the extraction of reusable components, and recyclable materials are disposed with solid wastes, burned by owners or discarded in dumpsites or landfills. Therefore, it was not possible to get any statistics on end-of-life volumes of e-waste. However much of the plastic/polymers which cannot be sold is not recycled including plastic and polymers from electronics and end of life vehicles. As a result, most of the plastic/polymers eventually end up in a disposal site (dumpsites) with associated open burning.

To better control of these wastes including also POPs, it is important that Myanmar improve the e-waste inventory and develop an appropriate frame for e-waste management. Myanmar is yet to establish legal frameworks for e-waste management or end-of life vehicles, considering Basel Convention and other guidelines.

### 2.3.3.3 Transport sector

c-PentaBDE (containing tetraBDE, pentaBDE, hexaBDE and heptaBDE homologues) has partly been used in polyurethane (PUR) foam in seats and head rest in cars, trucks and other vehicles. Mainly vehicles from the US are impacted where the largest share of c-PentaBDE has been used with production until 2004.

Although domestic public transport is presented through four indicators: Railways, road transport, water transport and airways, the inventory team focused on the road transport with the highest volume. It needs to be stressed that fire safety is high in

airplanes and in trains. Therefore, also polymers from airplanes and trains need to be managed in an environmentally sound manner.

Major information for this inventory was taken from Myanmar statistical yearbook 2016.

### 2.3.3.3.1 Import of vehicles

In Myanmar, automobile policy was changed in 2011, end of life vehicles was replaced with new vehicles. According to the rapid increasing of registered cars, it can be imagined that vehicles are increasingly imported to Myanmar and automobile productions are conducted in Industrial zones before. After the automobile policy is changed, automobiles production is conducted with Semi- knocked down- SKD and completely knocked down system nowadays.

### 2.3.3.3.2 Vehicles in use

The registered vehicles have increased several folds between 2000 and 2016. Passenger cars have increased from 173,444 in 2000 to 462,199 in 2016. Total polymer content in the 462,199 cars can be estimated to approx. 92440 t with a total PUR foam volume of 7395 t. The total amount of POP-PBDEs in vehicles is calculated according to the approach in the inventory guidance

$$PBDE_{\text{Vehicle category}} = \text{Number of vehicles}_{\text{category}} \text{ (manufactured 1975 to 2004)} \times \text{amount POP-PBDEs}_{\text{category}} \times F_{\text{regional}}$$

Impact factor 160 g c-PentaBDE for cars/ trucks and 640 g c-PentaBDE for buses (as buses in this inventory includes buses with seats number of range 30-40 with the majority of 32 seats and mini buses of seats number range of 14-26 with majority of 24 seats). This factor was estimated as suitable for buses in Myanmar since they are in average smaller compared to the busses considered in the Polybrominated diphenyl ethers (PBDE) inventory guidance.

- (1) regional factor of 0.05 for all vehicles as rarely vehicles were imported to Myanmar from USA (which would have a higher impact factor of 0.5);
- (2) TetraBDE, Penta BDE, hexaBDE and heptaBDE percentage of the amount of C-PentaBDEs are 33%, 58%, 8% and 0.5% respectively (Stockholm Convention 2012).

It was assumed that 50% of the vehicles registered in 2016 were produced before 2005.

With this approach and assumption of the number of cars registered in 2016, estimated amount of c-PentaBDEs contained in cars, trucks and buses are around 1849 kg,

1002 kg and 415 kg respectively. Therefore, the total amount of POP-PBDE in the transport sector is estimated to be around 3265 kg.

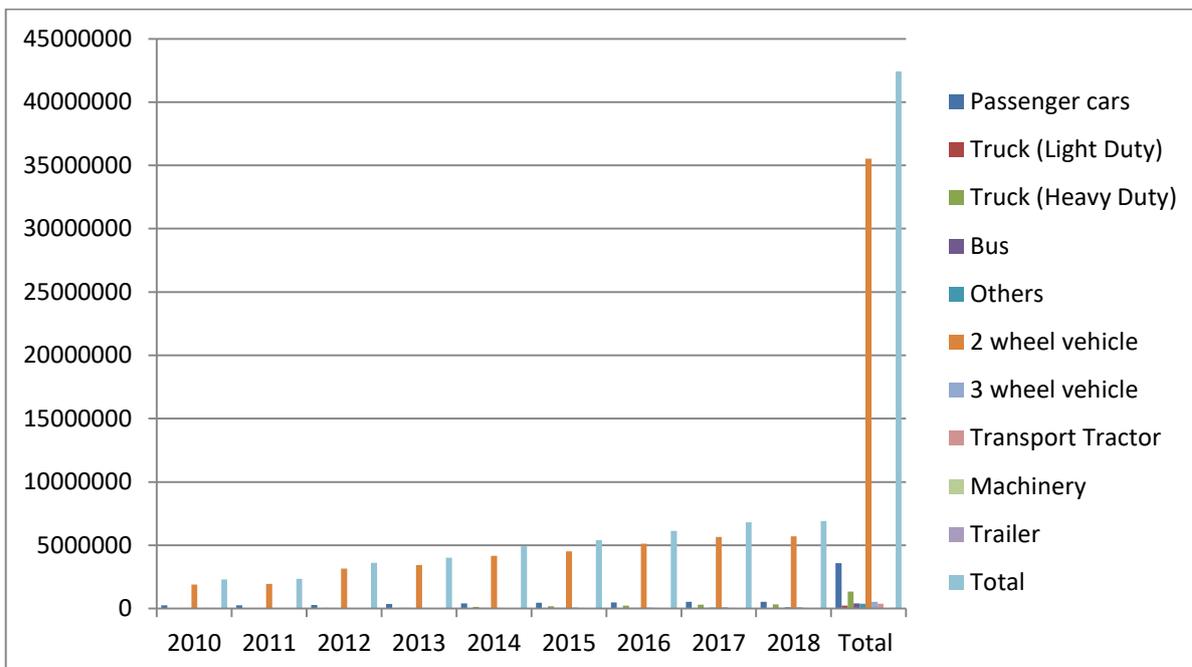
Overall this can be considered a lower estimate since DecaBDE has been listed in 2017 in the Stockholm Convention as POPs and has not been considered in this inventory since no guidance has yet been developed. DecaBDE is however a major commercial mixture used in vehicles<sup>57</sup> and even got an exemption for further use for vehicles in the POPs listing.

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<sup>57</sup> Kajiwara et al. (2014) Brominated flame retardants and related substances in the interior materials and cabin dusts of end-of-life vehicles collected in Japan. *Organohalogen Compd* 76,1022–1025.

**Table 19. Registered motor vehicle in Myanmar from 2010 to 2018**

No.	Type of vehicle	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
1.	Passenger cars	259712	263046	281575	359772	410930	448352	489158	529228	528248	3570021
2.	Truck (Light Duty)	27623	29173	29478	21043	24037	25397	26853	26733	27776	238113
3.	Truck (Heavy Duty)	36355	38053	41075	60945	116866	180622	236049	303288	333044	1346297
4.	Bus	20717	20065	19522	49760	52075	58031	59720	61096	57223	398209
5.	Others	15590	15212	17603	21978	39811	50586	60706	80898	90249	392633
6.	2 wheel vehicle	1880986	1933673	3153201	3418918	4161882	4504814	5122701	5640067	5703752	35519994
7.	3 wheel vehicle	12842	15867	36220	49639	62643	72723	81819	94821	97442	524016
8.	Transport Tractor	44852	38758	34862	33661	38144	43279	47684	48884	43877	374000
9.	Machinery	0	428	720	1041	1198	1371	1599	1906	1759	10022
10.	Trailer	-	-	-	-	4830	7363	11196	14536	15596	53521
<b>Total</b>		<b>2298677</b>	<b>2354275</b>	<b>3614256</b>	<b>4016757</b>	<b>4912416</b>	<b>5392538</b>	<b>6137485</b>	<b>6801457</b>	<b>6898966</b>	<b>42426827</b>



**Figure 15. Registered motor vehicle in Myanmar from 2010 to 2018**

### 2.3.3.3 End-of-life

There was no statistics available on scraped vehicles. A structured end-of-life vehicle management has not been developed in Myanmar.

### 2.3.3.4 Potential impacts

Exposure to PBDEs occurs along the life cycle of the products and materials.<sup>58</sup> In particular c-Penta treated polyurethane foam in vehicles, furniture, pillows and recycled materials can result in high exposure.<sup>59</sup> The exposure to PBDEs from WEEE plastic is lower with e.g. lower levels of Polybrominated diphenyl ethers (PBDE) in recyclers from BAT e-waste recycling facilities.<sup>60</sup> A high concern is the open burning of PBDE containing waste. In particular the smouldering of e-waste and cables can result in contaminated sites.

<sup>58</sup> Shaw SD, Blum A, Weber R, Kannan K, Rich D, Lucas D, Koshland CP, Dobraca D, Hanson S, Birnbaum LS. (2010) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Reviews on Environmental Health 25(4) 261-305

<sup>59</sup> Stapleton HM, Sjödin A, Jones RS, Niehüser S, Zhang Y, Patterson DG Jr (2008) Serum levels of polybrominated diphenyl ethers (PBDEs) in foam recyclers and carpet installers working in the United States. Environ Sci Technol. 42(9):3453-3458.

<sup>60</sup> Thuresson K, Bergman K, Rothenbacher K, Herrmann T, Sjölin S, Hagmar L, Pöpke O, Jakobsson K (2006) Polybrominated diphenyl ether exposure to electronics recycling workers--a follow up study. Chemosphere. 64(11), 1855-1861.

## **2.3.4 Assessment of HBCD (Annex A of SC Text, Part I and Part VII)**

### **2.3.4.1 General**

Hexabromocyclododecane (HBCD) is another prominent brominated flame retardant listed in Annex A of the Convention and used mainly 90% in expanded and extruded polystyrene (EPS/XPS) in building insulation. Minor uses were in textiles and in high impact polystyrene (HIPS) in electronics. These latter uses are considered to have stopped globally in production.

The HBCD inventory has been developed based on the Stockholm Convention inventory guidance for HBCD.

### **2.3.4.2 Production**

There is no HBCD production in Myanmar.

### **2.3.4.3 Inventory of HBCD in polystyrene (EPS and XPS) in current use and stock**

#### **2.3.4.3.1 Inventory of HBCD in EPS/XPS producing factories**

For HBCD inventory, ten EPS production factories, two XPS production factories and eight alternative used instead of EPS factories, total twenty factories have been inspected and their production volumes were assessed. In 2016, total volume of EPS produced from ten factories and XPS produced from two factories were 888,400 kg and 334,800 kg respectively. From the EPS product volume with assumed 0.7% HBCD addition among ten EPS production factories, two factories have been producing 35,000 kg and 16,290 kg of insulation foams with estimated HBCD content of 245 kg and 114 kg since 2011 and 2014, respectively. They are sourcing EPS from Asian countries where HBCD is still produced or used.

For imported XPS for foam rolls and polyfoam, the HBCD content was estimated to 1%. The total import of HBCD within a year was estimated to 67 and 23 kg respectively. For the past 5 years this would amount to approximately 450 kg HBCD.

Also some other insulation foams are used in Myanmar in particular orientated polypropylene (OPP). During this first inventory it was not clarified what flame retardants are use in this insulation.

Currently there are no specific safety standards for using insulation foam in construction. In recent years there were a range of large fires such as the Greenfell Tower where a high building burnt in London due to insulation foam made from polyisocyanurate (PIR) foam plates.

EPS, XPS and other alternatives raw materials such as general purpose polystyrene, orientated polypropylene and poly ether polyol are used as raw materials for insulation, construction and packaging products production which are taken in account in terms of Hexabromocyclododecane (HBCD) inventory in Myanmar.



**Figure 16. HBCD inventory activities**

**Table 20. List of imported amount of materials which contain EPS, XPS in Myanmar (2010- 2016)**

No	Items	Imported Amount of Material (kg)							Total Amount of Material (kg)
		2010	2011	2012	2013	2014	2015	2016	
1.	Packaging box	23976	57449	38497	47343	55272	1543997	67910	1834444
2.	XPS foam board	15200	7450	7000	15596	36038	42691	77586	201561
3.	Clothing for fire fighter	-	-	-	6024	86	19533	178	25821
4.	Mattress foam	33600	106080	36169	3000	391960	232648	331002	1134459
5.	Television	1410390	2446420	1355630	2357750	2106720	1668250	1464110	12809270
6.	Computer	13290	28265	57440	163460	176815	111745	211435	762450
7.	Printer	789830	295220	274850	530490	677210	511605	453810	3533015

No	Items	Imported Amount of Material (kg)							Total Amount of Material (kg)
		2010	2011	2012	2013	2014	2015	2016	
8.	Scanner	12400	17170	11825	10000	81795	318435	211790	663415
9.	Speaker	125306 0	235437 0	140053 0	130082 0	1086077 0	1399490	2913510	2148254 0
<b>Total</b>									<b>4244697 5</b>

**Table 21. List of expandable polystyrene (EPS) used in factory (concentration of HBCD): estimated 0.7%)**

No.	Factory Name & Starting Date	Raw Materials	Products	Application of Products	Reject Management	Consumption In 2016 (kg/yr)	Content of HBCD (kg/yr)	Address
1.	Yong Chang Foam Box Factory (2012)	EPS (China, Vietnam)	Foam Box	Packaging for exporting marine products	Recycle	127750	Likely no use	No.88/90, Tan Chack Won U Nyunt Street, Zone(2), Shwepyithar Township, Yangon
2.	Kywe Zeya Styrofoam Factory (1997)	EPS (Local)	Foam Box	Packaging for exporting marine products	Recycle	102200	Likely no use	No. (408), MyaTaung-wungyi U Hmo Street, ShweLinban Industry Zone, Yangon
3.	Tet Nay Won (2015)	EPS (China)	Foam Block	Foam block in Fishing	Recycle	32120	Likely no use	No. (49), U Ye Paw Street, HlaingTharYar Industry Zone (2), Yangon
4.	Golden Dragon (2014)	EPS (China)	(1) heat insulation foam (2) Foam Box	(1) insulation board in construction (2) packaging for exporting marine products	Recycle	(1) 16290 (2) 54750	(1) 114 (2) Likely no use	No. (22), Puntinwun U Shwebin Street, Zone (1), HlaingTharYar Township, Yangon.
5.	Golden City (2011)	EPS (Vietnam)	Heat Insulation Foam	Insulation board in Construction	Recycle	35000	245	No.395, MyaTaung-wungyi U Hmo Street,

No.	Factory Name & Starting Date	Raw Materials	Products	Application of Products	Reject Management	Consumption In 2016 (kg/yr)	Content of HBCD (kg/yr)	Address
								ShweLinban Industry Zone, Yangon
6.	Man Myanmar Foam Box Factory (2011)	EPS (China, Vietnam)	Foam Box	Packaging for exporting marine products	Disposed off	120,000	Likely no use	LL/79, Industrial Zone (2), Pyigyidagon Township, Mandalay Region
7.	Shwe HlaingTun Foam Box Factory (2012)	EPS (China, Vietnam)	Foam Box	Packaging for exporting marine products	Disposed off	120,000	Likely no use	LL44/40, betw. 64x65st Industrial Zone (2), Pyigyidagon Township, Mandalay Region
8.	YH Foam Box Factory (2013)	EPS (China, Vietnam)	Foam Box	Packaging for exporting marine products	Recycle	144,000	Likely no use	Shwe Ohu Min Kan Yeik Thar Pauk, Palake, Sinkkai Township, Mandalay Region
9.	Hi Chan (2013)	EPS (China)	Heat insulation foam	Insulation board in construction	Recycle	16290	Likely no use	Nwge Taung Village, Mandalay-Pyin Oo Lwin Highway, Mandalay Region
10.	Kaung Hein San (2011)	General Purpose Polystyrene (GPP)	Packing box	Food packaging box	Recycle	120,000	NC	64/65, Industrial Zone (1), Pyigyidagon Township, Mandalay Region
<b>Total EPS Production in 2016 (kg)</b>						<b>888400</b>		

**Table 22. List of extruded polystyrene (XPS) used in factory**

No.	Factory Name and Starting Date	Raw Materials	Products	Application of Products	Reject Management	Consumption In 2016 (kg per yr)	Content of HBCD (kg per yr)	Address
1.	Hi Star (2005)	GPP (General Purpose Polystyrene)	Packaging box	Food packaging box	Recycle	184800	Likely no use	20/22, Dagon Seikkan Industrial Zone, Yangon
2.	Myanmar Team (2011)	GPP (General Purpose Polystyrene)	Mega foam	Thermal Cups for hot and cold drinks	Recycle	150000	Likely no use	209 Bogyoke Road, Near 50 <sup>th</sup> Street, Pazundaung, Yangon Region
<b>Total XPS Production in 2016 (kg)</b>						<b>334800</b>		

**Table 23. List of alternative raw material used instead of EPS in factory**

No.	Factory Name and Starting Date	Raw Materials	Products	Application of Products	Reject Management	Address
1.	Jin Shwe Li	orientated polypropylene (OPP)	thermal insulation foam	insulation foam	Recycle	45, Shwe Lin Ban Industrial Zone, Yangon Region
2.	BGG Manufacturing Co.Ltd	orientated polypropylene (OPP)	thermal insulation foam	roofing sheet	Recycle	69, Shwe Lin Ban Industrial Zone, Yangon Region
3.	Swe Mon	orientated polypropylene (OPP)	thermal insulation foam	roofing sheet	Recycle	87, Hlaing Thar Yar Industrial Zone, Yangon Region
4.	Eva	orientated polypropylene (OPP)	thermal insulation foam	roofing sheet	Recycle	22, Hlaing Thar Yar Industrial Zone, Yangon Region
5.	Kyaw Thar	OPP	Thermal insulation foam	Thermal insulation foam	Recycle	80/81, Dagon Seikkan Industrial Zone, Yangon Region
6.	Polymer Co., Ltd	Poly ether polyol	Foam	Mattress foam	Recycle	25, Dagon Seikkan Industrial Zone, Yangon Region
7.	Myint Myat Kyaw	OPP PU	Thermal insulation foam	Thermal insulation foam	Recycle	80/81, Dagon Seikkan Industrial Zone, Yangon Region

No.	Factory Name and Starting Date	Raw Materials	Products	Application of Products	Reject Management	Address
8.	108	Luprante LPI (TDI)	Foam	Mattress foam	Recycle	Shwe Pauk Kan Industrial Zone

### 2.3.4.3.2 Other EPS / XPS products

For other polystyrene products imported for drinking cups and boxes and food contact materials it was assumed that no HBCD is present and they were therefore not considered for HBCD inventory.

Since EPS and XPS containing HBCD might be recycled or might be used for other purposes than insulation foam including food contact materials such as fish boxes<sup>61</sup>, an XRF screening was initiated within this NIP development to assess the presence of bromine in EPS/XPS in different uses<sup>62</sup>. The HBCD Task Team went to 3 major places in Yangon such as (1) Fish Market, Kyi Myint Taing Township in Yangon (2) Than Market Lan Ma Daw Township in Yangon (3) foam shops at 27<sup>th</sup> Street Panbedan Township in Yangon and 70 samples already in the market were analyzed by handheld XRF equipment. The results of analysis are shown in (Table 24. Summary data of initial screening of HBCD in EPS / XPS with handheld XRF equipment). Among 70 samples, minor bromine contents were found in 13 samples and there was no bromine in 57 samples.

Screening of HBCD was done for 60 EPS/XPS samples such as fish/ice box (25 samples), fish buoy (25 samples) and food packaging (10 samples), drinking cups and food dishes.

An initial screening was also conducted in 10 insulation foam boards from another unknown polymer composition (did not been dissolved in acetone). In this insulation foam, the bromine content range was 7 – 12 ppm in the analysis with XRF.

In this first screening, EPS/XPS with known HBCD content could not be measured. Further screenings are needed for reliable results.

<sup>61</sup> Rani M, Shim WJ, Han GM, Jang M, Song YK, Hong SH (2014) Hexabromocyclododecane in polystyrene based consumer products: an evidence of unregulated use. *Chemosphere* 110:111-119.

<sup>62</sup> Khin Thet Ni , Chaw Suhlaing, Weber R (2018) Development of the first HBCD inventory in Myanmar. Abstract 38th International Symposium on Halogenated Persistent Organic Pollutants (POPs), Krakow, Poland 25-31 August 2018.

**Table 24. Summary data of initial screening of HBCD in EPS / XPS with handheld XRF equipment**

No.	Polystyrene Product	No. of sample screened	No. of sample with Br	No. of sample without Br	Range of Br Content (ppm)
1.	Insulation foam board	10	3	7	7-12
2.	Fish/ Ice box	25	-	25	-
3.	Fish buoy (white)	25	10	15	22-29
4.	Food packaging, drinking cups and food dishes	10	-	10	-

#### **2.3.4.3.3 High Impact Polystyrene (HIPS) in electronics**

A minor amount of HBCD has been used in HIPS. HIPS is a versatile, economical and impact-resistant plastic that is easy to machine and fabricate. It is used for TV and audio-visual equipment parts, bicycle trailer, as well as in automotive industry for instrument panels and fittings.

Within this first inventory it could not be assessed how many of the EEE contain HIPS and if HBCD has been used as flame retardant.

#### **2.3.4.3.4 HBCD use in textiles**

An initial assessment of textiles which might contain flame retardants has been made. Flame retarded textiles are used in cars<sup>57</sup>, furniture, curtains, tents or uniforms. In this inventory, assessment of imported amount of uniforms for firefighters and curtains has been conducted. Total 25821 kg of uniforms for firefighters have been imported from 2013 to 2016. This might contain up to 26 t of HBCD. However testing of the flame retardants used in the uniforms was not conducted due to the lack of analytical capacity.

For curtains in total 6889.7 t were imported between 2010 and 2016. Within this first inventory no assessment could be made to what extent the curtains contained flame retardants and what type of flame retardants.

For textiles in cars no assessment and estimate has been made. These textiles should be managed together with other polymers at the end of life of vehicles.

#### **2.3.4.3.5 End of life management**

Also an assessment on current and future waste management practice of EPS in Myanmar is needed. This would be best developed within the frame of overall polymer management in Myanmar (polymers in transport, electronics, packaging).

Also current building codes for the use of polymers in construction should be evaluated and compared to building codes in other countries.

#### **2.3.4.4 Potential impacts**

The overall exposure from HBCD in polystyrene is considered low. Workers cutting polystyrene with hot wires are exposed at elevated levels<sup>63</sup>. Polystyrene can contribute to marine litter if not appropriately managed.

The exposure HBCD in textiles might have a higher exposure risk from fibres and related house dust ingestion. However as mentioned above it is not clear to what extent HBCD has been imported to Myanmar.

### **2.3.5 Assessment with respect to DDT (Annex B of SC Text, Part II)**

#### **2.3.5.1 General**

Dichlorodiphenyltrichloroethane (DDT) is one of the most prominent POPs pesticides and is listed in Annex B of SC Text with the exemption of malaria vector control. The half-life of DDT in humans is more than 4 years and the half-life for the degradation product DDT is probably longer. DDT is highly toxic to insects, shrimps and fish, and adversely affects the reproduction of wild birds through thinning of egg shells triggering the “Silent Spring book”, written by Rachel Carson in 1962. The global production of DDT for vector control is estimated to 4740 tonnes in 2005 and 6300 tonnes in 2007 in India alone.

#### **2.3.5.2 Import**

DDT has been imported to Myanmar in the past until 1996. After the ban of DDT no import has been registered. It is possible that DDT might have been illegally imported to the country.

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<sup>63</sup> Zhang H, Kuo YY, Gerecke AC, Wang J. (2012) Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. *Environ Sci Technol.* 46(20):10990-10996.

### 2.3.5.3 Export

There has been no export of DDT reported from the country.

### 2.3.5.4 Use

The use of DDT was banned since 1996 by the Ministry of Health and Sports (MOHS). But the remaining DDT stock was used in some selected areas until 2013. Now Malathion and Fendona are used instead of dichlorodiphenyltrichloroethane (DDT) in adult mosquito control. The utilization of remaining DDT stock, population coverage from 2006 to 2015 is compiled in the following tables.

**Table 25. Amount of DDT used in indoor residual spray in states and regions from (2006 – 2015)**

No.	Year	Spray Covered						Used Insecticides		
		Camp	Village	House	Others	Total Building	Population	DDT 75% (Kg)	Fendona Used Kg	Malathion 50%(cc)
1.	2006	4	32	6116	0	6116	33391	1119	0	242
2.	2007	2868	9	230	3098	3328	10479	596	0	0
3.	2008	14	6	3193	188	3327	12147	983	0	746
4.	2009	12	6	1493	87	1580	8871	330	0	0
5.	2010	3	25	2411	86	2497	10639	1084	91	0
6.	2011	3	2	281	50	331	1036	0	21	0
7.	2012	1434	58	8392	976	9368	56414	0	318	319808
8.	2013	1	2	653	27	680	3902	50	0	842916
9.	2014	0	52	5018	192	6584	31789	0	383.3	0
10.	2015	138	398	27318	5961	33279	129545	0	1595.95	0
<b>Total</b>		<b>4477</b>	<b>590</b>	<b>55051</b>	<b>10665</b>	<b>67090</b>	<b>298213</b>	<b>4162</b>	<b>2409.25</b>	<b>1163712</b>

### 2.3.5.5 Release and storage

Dichlorodiphenyltrichloroethane (DDT) stocks are stored in several stores around the country. In total the DDT stock is estimated to 23 t (see in following table). The DDT stocks are safely stored in separate rooms in the respective storage facilities. There is no release to surrounding area.

**Table 26. Amount of DDT remaining in state / region**

No.	State / Region	Amount of DDT (Kg)	Method of disposal
1.	Kachin	2421	Not disposed yet, stored
2.	Kayah	0	-
3.	Kayin	0	Put into tin container and buried in old concrete tank
4.	Chin	0	-
5.	Mon	875	Not disposed yet, stored
6.	Rakhaing	0	-
7.	Shan (South)	0	-
8.	Shan (North)	15825	Not disposed yet, stored
9.	Shan (East)	2.1	Not disposed yet, stored
10.	Sagaing	0	300 mg put into tin container and buried under ground 30 feet depth
11.	Thanintharyi	0	-
12.	Bago	20	Not disposed yet, stored
13.	Magwe	0	-
14.	Mandalay	825	Not disposed yet, stored
15.	Yangon	0	-
16.	Ayeyarwaddy	1525	Not disposed yet, stored
17.	Nay Pyi Taw	0	-
<b>Total</b>		<b>23,018.1</b>	-

**2.3.5.6 Potential impacts**

Dichlorodiphenyltrichloroethane (DDT) can contaminate humans and the environment for long time after released to the environment. DDT levels in human milk in countries which uses or used DDT until recently is high. Therefore DDT impact the general population and specifically infants or population living in houses which has been sprayed in the past.

## **2.3.6 Assessment of PFOS, its salts and PFOSF (Annex B of SC Text, Part III)**

### **2.3.6.1 General**

Per- and polyfluoroalkyl substances (PFAS) are a large group of more than 4500 fluorinated compounds<sup>64</sup>, including oligomers and polymers, which consist of neutral and anionic often surface-active compounds with high thermal, chemical and biological inertness. PFAS are used in many different chemical products and articles because of their desirable properties and as a result they find their way into the environment. The substances have extremely poor environmental biodegradability (persistent, P) and many of them accumulate in living organisms (bio-accumulating, B) and are toxic (T). There is a lack of overall knowledge of highly fluorinated substances and to prevent further pre-existing health and environmental problems from building up and persisting for a long time, it is important to control and where necessary to eliminate the use of these substances<sup>65</sup>. Therefore, PFAS have been listed as issue of concern under the Strategic Approach of International Chemical Management (SAICM).

Perfluorooctanesulfonate (PFOS) is one of the most relevant and toxic PFASs detected in wildlife and humans worldwide with associated health effects. PFOS and precursors of PFOS (PFOS related substances) were listed in Annex B of SC Text with a range of specific exemptions and acceptable purposes.

Other PFAS are not listed in the Stockholm Convention but perfluorooctanoic acid (PFOA) has been assessed by the POPs Review Committee and will be listed as POPs in 2019. Additionally, PFHxS is currently assess by the POPs Review Committee (POPRC) and it has been concluded that it meets the POPs properties.

### **2.3.6.2 Production**

PFOS and related substances are not produced in Myanmar but are only imported in products.

### **2.3.6.3 Import of PFOS and related substances**

The total import of firefighting foam in 2016 was 56,067 litres, out of which the Fire Service Department only used 1587 litres, the rest of 54,480 litres remaining in stock. Moreover, the import of alcohol-resistant foam was 9165 litres, which was not used within 2016 and can be found in stock.

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<sup>64</sup> OECD (2018) Towards a new comprehensive global database of Per- and Polyfluoroalkyl Substances

<sup>65</sup> Blum A, Balan SA, Scheringer M, Trier X, Goldenman G, Cousins IT, Diamond M, Fletcher T, Higgins C, Lindeman AE, Peaslee G, de Voogt P, Wang Z, Weber R (2015) The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs). *Environ Health Perspect* 1235 A107–A111.

In this first inventory it could not be clarified which share of these imported foams contain PFOS and related substances or other PFAS including PFOA suggested for listing as POP at COP 2019 or PFHxS currently evaluated in the POPs Review Committee. No other imported goods are considered to contain PFOS. However, other goods like impregnated textiles and synthetic carpets might contain PFOA or PFHxS or other PFAS (SAICM issue of concern).

## 2.3.6.4 Use and stocks of PFOS

### 2.3.6.4.1 Stock and use of PFOS in firefighting foam

The highest amount of firefighting foam (total 3296 litres) was used in Yangon region, while the second highest amount was about 455 litres which was used in Ya Khine state in 2016. In other states and regions of Myanmar, firefighting foam used amount was <200 litres. An overview is given in following table.

**Table 27. Utilization and stock of firefighting foam in 2016**

No.	States / Regions	Fire Fighting Foam (Litres)			Alcohol-resistant foam (Litres)		
		Import	Used	Stock	Import	Used	Stock
1.	Nay Pyi Taw	2932	-	2932	-	-	-
2.	Yangon	8765	-	8765	3146	-	3146
3.	Mandalay	2682	1046	1637	2273	-	2273
4.	Ayeyarwaddy	6865	-	6865	2864	-	2864
5.	Pegu	3287	18	3269	700	-	700
6.	Sit kaing	7956	123	7833	-	-	-
7.	Magyay	9933	341	9592	-	-	-
8.	Taninthayi	977	-	977	-	-	-
9.	Shan	5637	-	5637	-	-	-
10.	Rakine	1000	-	1000	-	-	-
11.	Mon	705	-	705	-	-	-
12.	Chin	2228	-	2228	-	-	-
13.	Kayah	1191	-	1191	-	-	-
14.	Kachin	727	-	727	182	-	182
15.	Karen	1182	59	1123	-	-	-
<b>Total</b>		56067	1587	54480	9165	-	9165

**Table 28. Firefighting foam used from 2015 to 2018**

No.	Date	Time	Location	Description	Foam used (L)
1.	26.2.2015	5:50	Mya Wa Dee township, Kayin State	Car Cruch and on fire bumping statue	27
2.	26.2.2015	12:50	Biscuit factory, Shwe Pyi Thar Industry Zone (3), Insein township, Yangon Region	Fuel tank truck on fire	114
3.	1.5.2015	1:00	No.(2) Kan Khaung quarter, Myeik township, Thanintharyee division	House's main switch on fire	23
4.	21.8.2015	11:30	No.(1), Myanmar Economic Cooperation gas station, quarter (2), Botataung township, Yangon Region	Acetelence gas tank's nut loose control and on fire	91
5.	21.8.2015	16:45	Quarter (4), Myawady township, Kayin State	Vehicle on fire because of battery terminal shock	9
6.	20.12.2015	11:40	Chan Aye Tharsan township, Mandalay Region	Strong liquor factory on fire	68
7.	4.12.2015	17:00	Inntaw township, Sagaing Region	Six wheels truck's nut loose control and on fire	91
8.	10.2.2016	9:42	Leway township, Nay Pyi Taw	Airplane cruch and on fire	91
9.	4.3.2016	11:15	Thanlyin township, Yangon Region	Gas station on fire because of buring incense stick	45
10.	28.4.2016	19:15	Two bagoda village, Oattwin township, Bago Region	12 wheels truck on fire	32
11.	16.5.2016	8:50	Pyin Mapin village, Mingalardon township, Yangon Region	Garage on fire	1205
12.	4.6.2016	9:40	No.(6) quarter, Pathein township, Ayeyarwadee Region	Electric cooker wire shock and on fire	23
13.	2.2.2017	9:30	Kaung Kan village, Hone Ma Lin township, Kanee, Saging Region	Fuel tanker truck on fire	23
14.	9.2.2017	22:45	Myike, Pulaw township, Thanitharyee Region	Diesel stored garage on fire	23
15.	24.2.2017	17:05	Amarapura, Mandalay Region	Gas station on fire	68
16.	15.3.2017	18:30	Pyi Taw Thar quarter, Kyautaw township, Ya Khine State	Gas station on fire	455
17.	15.3.2017	12:50	Yangon- Mawlamyine road, Thein gone quarter, Thahton, Mon State	12 wheels truck on fire	114

No.	Date	Time	Location	Description	Foam used (L)
18.	23.3.2017	15:45	Phar Arn, Kayin State	12 wheels truck on fire	23
19.	10.4.2017	00:35	Naung Lay Pin township, Bago Region	Fuel tanker truck on fire	23
20.	19.2.2018	10:45	Kan Phyu village, A Yar Taw township, Mone Your, Saging Region	Fuel tanker truck on fire	159
21.	23.2.2018	12:50	Pha Yar Ngu village, Ton Tay township, Yangon Region	Fuel tanker truck on fire	1841

#### **2.3.6.4.2 Sulfluramide (several different names) insecticide for ants and termite**

There is no registration for sulfluramide or other insecticides containing PFOS precursors.

#### **2.3.6.4.3 Aviation hydraulic fluid**

There are 11 airlines operated in Myanmar and 53 aircrafts registered in Myanmar. None of the aviation hydraulic fluids assessed in the inventory contained PFOS. The information related to chemical composition and concentration of each brand was collected from the Material Safety Data Sheet (MSDF).

#### **2.3.6.4.4 Chromium plating and other plating**

There is no chromium or other metal plating process operating in Myanmar.

#### **2.3.6.4.5 Carpets and other treated material**

Synthetic carpets imported to Myanmar in particular before 2002 might contain PFOS. Due to the long service life, some of these carpets might still be in use. Synthetic carpets imported after 2002 might contain other PFAS. An assessment of potential quantities has not been conducted in this first inventory.

#### **2.3.6.5 Potential impacts**

From studies in other countries contamination of ground water reservoirs and drinking water are known. Currently no information is available for Myanmar and therefore an impact cannot be estimated.

## 2.3.7 Assessment of releases of unintentional produced chemicals (Annex C of SC Text)

### 2.3.7.1 Background

Polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), together with polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), hexachlorobenzene (HCB), pentachlorobenzene (PeCB) and hexachlorobutadiene (HCBd) are listed in Annex C of the SC as unintentionally produced POPs (UPOPs). PCBs, PCNs, HCB and PeCB have also been industrially-produced and used in several applications. PCDD/Fs were not produced commercially,<sup>66</sup> and they have no known use. PCDD/Fs and the other UPOP formation and/or releases arise mainly from four types of sources. These releases are process-related:

- (1) Chemical production processes: e.g., the production of chlorine, chlorinated phenols and other chlorinated aromatic compounds; the production of chlorinated solvents and oxychlorination of mixed feeds to make chlorinated solvents; the use of chlorine in industrial process like the production of magnesium, titanium oxide or pulp and paper;
- (2) Thermal and combustion processes: destruction of POPs and other organochlorine containing waste, incineration of wastes, the thermal processing of metals scraps;
- (3) Biogenic processes or photolytic processes: which can form PCDD/Fs from precursors mostly of anthropogenic origin such as pentachlorophenol and other chlorinated phenols. Also, the degradation of certain organochlorines can form UPOPs; e.g., pentachloronitrobenzene (PCNB) (Quintozene) partly degrades to PeCB and is considered one of the largest sources of PeCB;<sup>67</sup>
- (4) The fourth and the largest source, is related to past releases of UPOPs<sup>68</sup>: Soils and sediments which have accumulated PCDD/Fs and other (U)POPs over the last 100 years of releases from application of organochlorines containing UPOPs or releases from incinerators, metal industries and open burning. The PCDD/F-contaminated sites, soils, and sediments from the past release are still relevant for food contamination (e.g. fishes, chicken/egg, grazing cattle and milk and dairy products).<sup>69</sup>

PCDD/Fs production are from reservoir sources, such as landfills and dumps of PCDD/Fs and other UPOPs containing wastes from chlorine and organochlorine

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<sup>66</sup> With the exception of analytical standards.

<sup>67</sup> Stockholm Convention document from the 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/21)

<sup>68</sup> For an overview: Weber R, Gaus C, Tysklind M et al. (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. *Env Sci Pollut Res* 15, 363-393.

<sup>69</sup> Weber R, Herold C, Hollert H, Kamphues J, Blepp M, Ballschmiter K (2018) Reviewing the relevance of dioxin and PCB sources for food from animal origin and the need for their inventory, control and management. *Environ Sci Eur.* 30:42. <https://rdcu.be/bax79>

production. Historic inventories (e.g. release of historic PCDD/F from pesticide use in Japan of approximately 460 kg TEQ or the landfill disposal of 330 to 854 kg TEQ from a single pesticide production in Germany or dioxin release of more than 366 kg TEQ from spraying of defoliants in the Vietnam War<sup>70</sup> reveal that they have exceeded by far the documented releases from total contemporary global releases of 100 kg TEQ/year.<sup>71</sup>

### 2.3.7.2 Inventory of PCDD/Fs and other unintentionally-produced POPs

The purpose of the unintentional-POPs inventory was to evaluate for the first time the release of PCDD/F of all relevant sources in Myanmar and to develop a baseline inventory. Since PCDD/Fs and the other listed unintentional-POPs (PCBs, PCNs, HCB and PeCB) are formed together during incineration and other thermal processes, the Toolkit recommends, for practical reasons, that inventory activities be focused on PCDD/Fs, as these substances are indicative of the presence of other unintentional POPs (UNEP 2013)<sup>72</sup>. For these sources PCDD/Fs are considered to constitute a sufficient basis for identifying and prioritizing sources and control measures for all Annex C POPs of SC Text and for evaluating their efficacy. Since the major UPOPs emission sources in Myanmar are incineration and other thermal sources without organochlorine production, the inventory focused on PCDD/Fs as representative for all UPOPs.

The study has been conducted by the dioxin task team organized with members from City Development Committee (CDC), Ministry of Planning Finance and Industry (MOPFI), Ministry of Education (MOE) and Ministry of Natural Resources and Environmental Conservation (MONREC).



**Figure 17. UPOPs inventory activities**

<sup>70</sup> Stellmann MJ, Stellmann SD, Christian R, Weber T, Tomasallo C (2003) The extent and patterns of usage of Agent Orange and other herbicides in Vietnam. *Nature* 422, 681-687.

<sup>71</sup> Wang B, Fiedler H, Huang J, Deng S, Wang Y, Yu G (2016) A primary estimate of global PCDD/F release based on the quantity and quality of national economic and social activities. *Chemosphere*. 151, 303-309.

<sup>72</sup> UNEP (2015) Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs under Article 5 of the Stockholm Convention on Persistent Organic Pollutants <http://toolkit.pops.int/>

Potential releases of PCDD/PCDF emission to air, water, land, product and residue in Myanmar were calculated by multiplying mass production (tonnes/year) and emission factor proposed by the “Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs” updated by UNEP Chemicals in 2013 (UNEP 2013).

The Toolkit assists countries in identifying sources and estimating releases of PCDD/Fs from all sources and selected other UPOPs for some sources. The procedures proposed by the toolkit and used by the project team is the five-step approach:

- (1) Apply Screening Matrix to identify Main Source Categories;
- (2) Check source categories to identify existing activities and sources in the country;
- (3) Gather detailed information on the processes and classify processes into similar groups by applying the Standard Questionnaire;
- (4) Quantify identified sources with default/measured emission factors;
- (5) Apply nation-wide to establish full inventory and report results using guidance given in the standard format.

All 10 source groups and related source categories were assessed in the inventory. The investigated source groups included: (1) waste incineration; (2) ferrous and non-ferrous metal production; (3) power generation; (4) production of mineral products; (5) the transport sector; (6) open burning; (7) production and use of chemicals and consumer goods; (8) miscellaneous, (9) disposal; and (10) contaminated sites. The estimated emissions and concentrations, which have been determined, are presented for each source group and category.

The summary of PCDD/PCDF releases in Myanmar in 2016 is compiled in below Table. The total emission from inventoried sources were 854.1 g TEQ/a. The highest share of PCDD/PCDFs released stem from open burning with an estimated release of 431.1 gTEQ/a (50.5% of total). The second most relevant source is waste incineration emitting 367.2 gTEQ/a (43.0% of total), the main source here are hospital waste incinerators operating in batch mode with a release estimate of 366.8 g TEQ/a. The third largest source is ferrous & non-ferrous metal production with 14.6 g TEQ/a release (1.7% of total) and production of mineral products (cement industry) with a release of 6.95 g TEQ/a (0.8% of total). For chlorinated chemicals only the release from 2,4-D was assessed and estimated to 2.7 g TEQ/a (0.3%). All other sources were below 0.1% of releases and therefore negligible.

Information on sites potentially contaminated with PCDD/Fs is compiled in chapter 2.3.8.5 below.

**Table 29. PCDD/F release in Myanmar for the baseline inventory 2016**

No.	Source Groups	Annual Releases (g TEQ/a)					Total (g TEQ/a)	%
		Air	Water	Land	Product	Residue		
1.	Waste Incineration	365.0	0.00	0.00	0.00	2.18	367.2	43.0
2.	Ferrous and Non-Ferrous Metal Production	5.85	0.00	0.00	0.00	8.78	14.63	1.71
3.	Heat and Power Generation	0.55	0.00	0.00	0.00	0.00	0.55	0.06
4.	Production of Mineral Products	6.92	0.00	0.00	0.00	0.00	6.93	0.81
5.	Transportation	0.08	0.00	0.00	0.00	0.00	0.08	0.01
6.	Open Burning Processes	417.4	0.00	13.68	0.00	0.00	431.1	50.5
7.	Production of Chemicals and Consumer Goods	0.09	0.00	0.00	2.84	0.00	2.93	0.34
8.	Miscellaneous	0.29	0.00	0.00	0.00	0.00	0.29	0.03
9.	Disposal	0.00	0.18	0.00	0.00	30.24	30.43	3.56
10.	Identification of Potential Hotspots	-	-	-	0.00	0.00	-	-
<b>Total</b>		<b>796.2</b>	<b>0.2</b>	<b>13.7</b>	<b>2.8</b>	<b>41.2</b>	<b>854.1</b>	100
<b>Grand Total</b>		<b>854.1</b>					-	-

### 2.3.8 Information on the state of knowledge on contaminated sites and wastes, identification, likely numbers, remediation measures, and data on releases from sites

This section compiles information on contaminated sites for individual POPs. The inventory of stocks and wastes for the individual POPs are included in the individual POPs section above.

#### 2.3.8.1 POPs pesticides contaminated sites

An initial assessment of POPs pesticides contaminated sites has been conducted during the inventory development. With the support and arrangement by PPD, POPs pesticides task team visited Magwe for taking soil samples in 2017.



**Figure 18. Inventory of POPs pesticides contaminated sites**

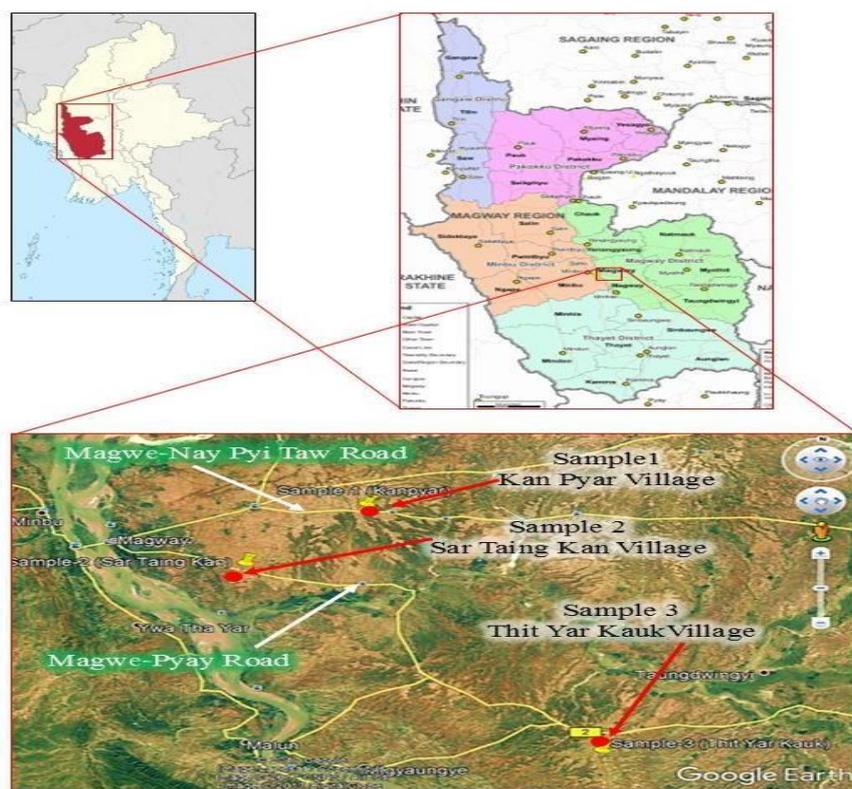
Also with the assistance of Magwe Region PPD, soil samples from Kan Pyar Village (Latitude 30° 11' 35" N and Longitude 95° 5' 6" E), Sar Taing Khan Village (Latitude 20° 8' 56" N and Longitude 94° 57' 37" E) and Thit Yar Kauk village (Latitude 19° 55' 46" N and Longitude 95° 15' 34" E) were collected according to soil sampling procedures.

For one acre of groundnut growing field, ten soil samples were collected by random number system by digging one foot depth and made to composite sample of total weight of one kilogram.

The location of sample collecting positions in Magwe Region and the random number soil sample collecting system for one acre were shown in Table below.

The collected soil samples were submitted for testing at Pesticide Analytical Laboratory of PPD on 6<sup>th</sup> December 2017.

The probable human intake of soil is much lower than one kilogram and when comparing converted acceptable daily intake, it can be considered that the soil of groundnut growing area of three villages are not contaminated with POPs pesticides based on the results of taken soil sample.



**Figure 19. Location of sample collection positions in Magwe region**

The residue content of soil samples from three villages are summarized in the table below.

**Table 30. Residues analysis results of soil sample from three villages**

No.	Analysis Parameters	Residue content of soil sample from villages ( $\mu\text{g}/\text{kg}$ )		
		Kan Pyar	Sar Taing Khan	Thit Yar Kauk
1.	Hexachlorocyclohexane / Benzene Hexachloride ( $\alpha, \beta, \gamma, \delta$ )	9.76	10.85	11.50
2.	Heptachlor	5.90	2.67	6.9
3.	Aldrin	0.75	0.26	3.27
4.	Heptachlor Epoxide	5.46	0.83	2.00
5.	Endosulfan ( $\alpha, \beta$ )	0.87	1.93	3.80
6.	Chlordane	-	9.39	-
7.	O,P'-DDT	5.70	1.46	6.83
8.	P,P'-DDT	3.68	0.76	2.20

According to the table, the residue content is given in microgram ( $\mu\text{g}$ ) and was obtained by analyzing one kilogram of soil sample.

#### **2.3.8.2 PCB contaminated sites**

In Myanmar, there are temporary transformer maintenance sites in most of the Regions and States where old transformers are repaired and reused. Moreover, the PCB task team found that there are three old transformer disposal sites from which one is the Hydropower Plant Disposal Site in Lawpita, Kayar State. Another two in Yangon region, Hong Hai Substation and 24 Hours Distribution & Maintenance Department at Bottom Kyiemyinttai Road, Ahlone Township under YESC (Yangon Electricity Supply Corporation) can be found as disposal sites. Therefore, Lawpita dump site, Hong Hai Substation and 24 Hours Distribution & Maintenance Department can be found as current transformer disposal sites in Myanmar. In terms of PCB contaminated site, one possibility is that above mentioned disposal sites might have got contaminated when PCB contaminated transformer oil has been removed or changed and in addition unintended releases to surroundings nearby may have occurred. Also, areas where old transformer oil has been recycled might be contaminated and should be taken into account.

#### **2.3.8.3 POP-PBDE, HBB and HBCD waste and contaminated sites and hotspots**

In terms of contaminated sites for POP-PBDE, HBB and HBCD, plastic and e-wastes disposal sites should be taken into account. In Myanmar, there is no rules and regulations related to management of plastic wastes and management of plastic from end-of-life vehicles and products are not issued yet. Some recyclable plastic wastes are recycled and some are disposed with solid wastes in dumpsites or landfills. According to data inventory, there are more than 287 plastic recycling factories with majority of nearly 80% in Kachin, Yangon and Mandalay regions in Myanmar.

#### **2.3.8.4 PFOS contaminated sites and hotspots**

Information related to PFOS contaminated sites resulted from locations where firefighting foams were used, such as sites of fire events and areas used for fire-brigade exercises and tests. In Myanmar, there are trainings for firefighting practice especially in Nay Pyi Taw, Yangon and Mandalay division but only a small amount of firefighting foam was used in these areas because of high cost.

Recently, a significant amount of Aqueous Film Forming Foams (AFFF) firefighting foam was used for the Htein Bin dumpsite fire which is the biggest dumpsite in Yangon division with over 120 hectares of which over 40 hectares were on fire for more than a week in April 2018. In order to put out the fire, 13,638 Liters of water with 3% of

Bio Foam (Orchids AFFF 3 % UL Class A and B Buckeye BFC 3.1 Platinum 3% AFFF) were used at Htein Bin dumpsite. This might have caused a considerable contamination of the environment. The foams used in this recent fire did likely not contain PFOS but other PFAS.

### **2.3.8.5 PCDD/F and UPOPs contaminated sites and hotspots**

#### **2.3.8.5.1 Production sites of chlorine**

There is no operating chlorine production in Myanmar. One paper mill - Tharbaung paper factory - produced chlorine on site. However, the factory has not been running since 2014.

#### **2.3.8.5.2 Production sites of chlorinated organics**

Myanmar had a factory which produced organochlorine pesticides (e.g. endosulfan) at low capacity. The landfill and production site might have some unintentional POPs contamination.

#### **2.3.8.5.3 Application sites of PCDD/PCDF containing pesticides and chemicals**

Some pesticides (formerly) used in Myanmar might contain PCDD/PCDF. In history similar pesticide mixtures to Agent Orange were used for spraying of poppy fields (Seekins 2006).

#### **2.3.8.5.4 Timber manufacture and treatment sites**

There is wood treatment sites which are potentially contaminated with chemicals used for wood preservation. In this first inventory a detailed assessment of chemicals used for wood preservation has not been conducted. PCP might have been used at some of these sites with potential contamination of PCDD/PCDFs. PCP was only listed 2015 and has not been addressed in this first NIP but will be addressed in next NIP update.

#### **2.3.8.5.5 Textile and leather factories**

There are some textiles and leather factories which might have used chemicals containing PCDD/Fs (e.g. PCP or chloranil).

#### **2.3.8.5.6 Use of PCB**

PCBs have been used in Myanmar in transformers and capacitors and possibly other uses. Some potentially contaminated sites have been found during the development of the PCB inventory. These might also be contaminated with PCDFs present in the PCBs.

#### **2.3.8.5.7 Waste incinerators**

There are a range of waste incinerators in Myanmar. The healthcare waste incinerators are mostly small scale batch incinerators with high emissions (see inventory category 1). Areas close to the incinerator might become contaminated with PCDD/PCDFs and other UPOPs over time. The release from the BAT/BEP municipal waste incinerators is considered low and does not result in the contamination of the surrounding if the ashes are appropriately managed.

#### **2.3.8.5.8 Metal industries**

There are only a few metal industries with release potential for PCDD/PCDFs. Releases from these metal industries.

#### **2.3.8.5.9 Dumps of wastes/residues from source groups 1-9**

Areas where fly ashes from waste incinerators or fly ashes from metal industries are disposed contain PCDD/PCDFs and other UPOPs and heavy metals. A detailed assessment for the disposal sites for the individual facilities has not been conducted in this first inventory.

### **2.3.9 Summary of future production, use, and releases of POPs – requirements for exemptions**

#### **2.3.9.1 Background**

A range of POPs has been listed with specific exemptions or acceptable purposes and can be used if a country has registered for an exemption. If a country has registered for an exemption it can import and use the exempted POPs for the registered use.

In this section the current and potential future use of POPs are shortly summarized for Myanmar and the need for an exemption is mentioned.

### **2.3.9.2 Production, use, import and export of POPs listed in Annex A and B of Stockholm Convention**

#### **2.3.9.2.1 Production of POPs listed in Annex A and B of SC Text**

According to the information obtained in this inventory there is no current production of any POPs in Myanmar. Only a small amount of Endosulfan 35 EC has been produced in the country between 1991 and 1998 and stopped. There is currently no plan of future production of any POPs listed in Annex A and B of SC Text.

#### **2.3.9.2.2 Use of Annex A and B POPs of SC Text**

There is likely some use of HBCD in polystyrene foam production and import. There are currently PFOS containing firefighting foams in stocks. There are still transformers and possible other equipment in use containing PCBs. Myanmar is currently developing a PCB inventory for an overview of current use and further planning. For the continued use of PCB containing equipment, no specific exemption is needed. However, the SC requires Parties to phase out the use of PCBs in equipment by 2025 and ensure elimination of PCBs by 2028. The plan is to stop the use of PCBs by 2025.

The POPs recently listed in 2015 and 2017 have not been assessed in this NIP development. Therefore, it is not known if the POPs with listed exemptions – PCP, short chain chlorinated paraffins (SCCPs) and c-DecaBDE - are currently used and if there is a need of future use. This needs to be done in an update of the NIP.

#### **2.3.9.2.3 Import and export of Annex A and B POPs of SC Text**

There is currently possibly still import of HBCD for polystyrene production and possibly import of PFOS containing firefighting foams. However, already alternative foams are partly used in Myanmar and therefore there is no need of future importation of PFOS containing foam.

### **2.3.10 Existing programmes for monitoring releases and environmental and human health impacts, including findings**

An assessment of POPs impacted population was conducted with questionnaire and general medical examination of 629 workers with a probable exposure to POPs.

The **polychlorinated biphenyls (PCB)** impacted population assessment was done by interviewing 59 workers who may have been exposed to transformer oil used at power stations in Yangon Region, Magwe Region and Kayar State.

For assessing of potentially **hexabromocyclododecane (HBCD)** impacted workers, the investigation was conducted in Kywe Zeya Styrofoam Factory, Golden City

Factory, Tet Nay Won Factory and Golden Dragon factory which are situated in Hlaing Tharyar and Shwe Lin Ban Industrial Zones, Yangon Region.

A **dichlorodiphenyltrichloroethane (DDT)** impacted population assessment was done in No. (22) Heavy Industry, Beelin Township, Mon State.

A **PCDD/F** impacted population assessment was done by interviewing workers in industries with likely PCDD/F emission in Mandalay Region.

A **polybrominated diphenylether (PBDEs)** impacted population assessment was done in polyurethane (PUR) application for insulation boards Manufacturing Factory located in Hlaing Tharyar Industrial Zone.

A **POPs pesticides** impacted population assessment was done in four villages in Hintada Township, Ayeyarwaddy Region. The agriculture workers in this survey had the history of using POP pesticides at their farms mostly aldrin and dieldrin in the last 25 years. These POPs pesticides were used in cabbage, flower and bean farms. Past medical history of POPs exposed people and their family members are listed in Table 31 and Table 32.

**Table 31. Past medical history of potentially POPs exposed people (2017)**

No.	Past medical history of POPs exposed people	Pesticides (n=203)	DDT (n=163)	PCDD/F (n=81)	HBCD (n=73)	PBDE (n=50)	PCB (n=59)	Total (n=629)
1.	Hypertension	50	14	3	-	4	5	<b>76</b>
2.	Muscle stiffness	38	-	-	-	-	-	<b>38</b>
3.	Muscle weakness	6	-	-	-	-	-	<b>6</b>
4.	Tinkling & numbness of lower limb	15	-	-	-	-	-	<b>15</b>
5.	Dizziness	13	7	-	-	-	-	<b>20</b>
6.	Gastritis	7	11	-	5	1	1	<b>25</b>
7.	Joint pain	28	11	-	2	4	1	<b>46</b>
8.	Back pain	10	4	-	-	-	-	<b>14</b>
9.	Epilepsy	1	-	-	-	-	-	<b>1</b>
10.	Ischaemic heart disease	9	9	1	-	1	1	<b>21</b>
11.	Bronchitis	1	-	2	1	2	-	<b>6</b>
12.	Asthma	6	4	-	-	-	1	<b>11</b>

No.	Past medical history of POPs exposed people	Pesticides (n=203)	DDT (n=163)	PCDD/F (n=81)	HBDC (n=73)	PBDE (n=50)	PCB (n=59)	Total (n=629)
13.	Tuberculosis	9	7	-	1	-	-	17
14.	Hyperthyroidism	3	-	-	-	-	-	3
15.	Goiter	5	2	-	-	-	-	7
16.	Dermatitis	1	-	-	-	1	-	2
17.	Abortion	16	-	-	-	-	1	17
18.	Diabetes Mellitus	2	4	1	-	2	2	11
19.	Nephritis	-	5	1	-	-	-	6
20.	Renal stone	-	-	1	-	-	-	1
21.	Viral hepatitis	-	5	3	-	3	-	11
22.	Stroke	-	5	-	-	-	-	5
23.	Malaria	-	7	-	-	-	-	7
24.	Typhoid	-	-	-	-	2	-	2
<b>Total</b>		<b>220</b>	<b>95</b>	<b>8</b>	<b>13</b>	<b>20</b>	<b>12</b>	<b>368</b>

**Table 32. Past medical history of family members**

No.	Past medical history of family members	Pesticides (n=203)	DDT (n=163)	PCDD/F (n=81)	HBDC (n=73)	PBDE (n=50)	PCB (n=59)	Total (n=629)
1.	Hypertension	8	19	1	8	5	2	43
2.	Stroke	9	5	-	1	-	1	16
3.	Tinkling & numbness of lower limb	4	-	-	-	-	-	4
4.	Joint pain	2	1	-	1	3	-	7
5.	Epilepsy	2	-	-	-	-	-	2
6.	Ischaemic heart disease	4	6	-	1	3	2	16
7.	TB	10	5	-	1	-	-	16
8.	Bronchitis	-	-	-	-	2	-	2

No.	Past medical history of family members	Pesticides (n=203)	DDT (n=163)	PCDD/F (n=81)	HBDC (n=73)	PBDE (n=50)	PCB (n=59)	Total (n=629)
9.	Asthma	3	2	-	-	-	1	6
10.	Ca Breast	2	-	-	-	-	-	2
11.	Ca larynx	1	-	-	-	-	-	1
12.	Diabetes Mellitus	3	9	-	-	-	3	15
13.	Gastritis	2	2	-	-	-	-	4
14.	Malaria	2	-	-	-	-	-	2
15.	Nephritis	-	2	-	-	-	-	2
16.	Cancer	-	2	-	-	-	-	2
17.	Hepatitis	-	1	1	-	-	-	2
18.	Psychiatric problem	-	-	1	-	1	-	2
<b>Total</b>		52	54	3	12	14	9	144

In conclusion, all of health impacts discovered can be caused by exposure to POPs but cannot be clearly concluded because no analysis of POPs in workers and other population were done. Further investigations and analysis should be carried out to assess health impacts of POPs.

Up to now only some monitoring for POPs pesticides contaminated sites has been conducted.

For PCBs the monitoring of transformers has started by using L2000 analyser. No other monitoring for PCBs has been conducted due to the lack of analytical capacity.

Initial screening of HBCD was conducted for EPS/XPS in food contact materials and some other EPS/XPS.

For most POPs no monitoring capacity exists and Myanmar has not yet participated in the activities of the Global Monitoring Plan (GMP).

One researcher from Myanmar has participated at the global POPs conference 2018 to get an overview on current monitoring approaches of POPs and other organohalogen compounds.

## **2.3.11 Current level of information, awareness, and education among target groups; existing systems to communicate such information to the various groups**

### **2.3.11.1 Overview of public information policy and practice related to environment**

To give an overview of the mechanisms that are in place to convey environmental information to the public: Commonly the international and national affairs and information dissemination section is organized under the Secretary Office of every Ministry with the purpose of dissemination the Ministry related information to the public. Also, one spokesperson is allocated for every Ministry and the spokesperson is accountable to announce the information on behalf of the Ministry through media and letters. This is a general mechanism to convey the information to the public in Myanmar.

The Ministry of Information is a responsible and prime ministry for distribution of news and information to the public. The ministry is disseminating the information to the public with the purpose of entertainment, education and announcement. The daily and update information such as news, newspapers, regional news, etc., laws including by-laws and draft laws, and other important web links can be assessed through online ministry web page (<http://www.moi.gov.mm>) by dual languages (Myanmar and English).

Particularly, the environmental information such as natural disaster announcement is commonly being conveyed to the public via radio and television channels, and media such as internet websites of ministries. In addition, the particular channels such as Agriculture and Forest Channel and Farmer Channel mainly broadcast about agriculture/farming/forestry programs, news, and their relevant activities.

Furthermore, the Ministry of Natural Resources and Environmental Conservation (MONREC) is acting as a major ministry for the preparation of environmental related laws/rules/procedures/ policies/guidance, the management of environmental issues, and the development of environmentally friendly businesses and sustainable projects in Myanmar. One of the sections under the MONREC is focusing on organizing the training, research, and knowledge sharing programs/ workshops/seminars/conferences related to the environment in order to raise public awareness.

### **2.3.11.2 Specific practices by governments and stakeholders in ensuring public awareness and involvement activities**

#### **2.3.11.2.1 Ministry of Natural Resources and Environmental Conservation**

The Ministry of Natural Resources and Environmental Conservation (MONREC) is implementing the public awareness and involvement activities by arranging workshops/public consultations in villages in rural area/districts/industry zones and special talks in schools at environmental ceremonies/events in cooperation with national and

international governmental and nongovernmental organizations/associations. Moreover, the officers from the MONREC teach environmental management subjects at various training centers/courses such as Central Forest Development Training Center (CFDTC), Central Cooperative Collage, Central Institute of Civil Service, Yangon City Development Committee (YCDC)'s training school, Basic Tourism Management Training, and Training Schools of Myanmar Police Force, to enhance the capacity of human resources.

The MONREC published the environmental conservation manual in July 2013 with the purpose of using as handbook for public service personnel under the MONREC. In addition, the internal staffs and officers under the MONREC are being informed about POPs substances and environmental conservation through the department training courses for capacity building of staffs and officers. Using the handbook, the officers of the MONREC educate the public at basic education schools and people from the rural area. In order to broaden the environmental knowledge of the public, the MONREC annually holds environmental ceremonies as well as various contests such as photo contest, poster contest, and essay/article contest on World Environment Day and World Ozone Day. According to the annual record, the MONREC conducted such public involvement activities: 159 times in 2013, 181 times in 2014, 201 times in 2015.

However, the distribution of environmental information to the public by the MONREC is still very limited due to the insufficient budget for developing public information and awareness programs/campaigns at national level.

#### **2.3.11.2.2 Ministry of Information**

The Ministry of Information commonly announces public information on printed media (government newspapers: Myanmar Alinn, The Mirror, and The Global New Light of Myanmar), Myanmar Radio and Television Media (Channels: MRTV, MRTV News, MITV, MNTV, Farmer, Hlauttaw, NRC), Internet (Online), and MOI Web portal. Similarly, the information and public relations department organizes photo contest, talks, wall poster, and brochure as the information dissemination practices. The information related to environmental, agriculture, industry broadcasts as TV educated programs and interviews in cooperation with the relevant ministry. Specifically, programs related to the safe handling of pesticides (four educated programs, three drama programs and interviews) and programs related to natural disaster prevention and forest conservation (seven educated programs and two interviews) are broadcasting often on Television with the cooperation of the relevant departments and ministries such as forest department, agricultural department, YCDC, MCDC, and environmental conservation department. This ministry performs the public awareness and education activities with a particular annual budget.

#### **2.3.11.2.3 Ministry of Agriculture, Livestock and Irrigation**

The Ministry of Agriculture, Livestock and Irrigation (MOALI) is an important ministry related to POPs pesticides management. The MOALI disseminates the knowledge to the public mainly through TV-Farmer Channel and the Journals of Agricultural Education. Also, the POPs related information can be accessed either call center via Internet or webpage of the Ministry. Moreover, the Farmer Field Schools and the certified courses for systematic usage of pesticides provide the information of restricted POP Pesticides and hazards caused by POPs to the farmers as well as to the staffs from the sale companies. Simultaneously, the MOALI is performing the survey on the POP pesticides in stock and inventory taking process. The inspectors from the MOALI annually conduct the investigation on POP Pesticides usage in each region and state of the country. As a future activity for educating to the farmers and peasants, the MOALI has a plan to arrange the Good Agricultural Practices (GAP) Courses. The MOALI cooperates with the MONREC and MOHS for exchanging of POPs related information.

#### **2.3.11.2.4 Ministry of Planning, Finance and Industry**

The Ministry of Planning Finance and Industry (MOPFI) is in a major role in controlling the manufacturing, utilizing, and handling of the POPs industrial chemicals and POPs by-products. The entrepreneurs and traders have been informed about the restriction of the export and import of such banned chemicals including POPs substances by the notification (3/2016) in accordance with law and rule. In general, the MOPFI announces the environmental and POPs information and knowledge articles in Myanmar Industrial Digest, government newspaper, journal of commerce, and journal of golden industry since 2013. Also, the officers from the MOPFI arrange seminars and education programs, particular at Myanmar Engineering Society with the topic of chemical handling and management. The MOPFI initiated the Global Harmonized System (GHS) by categorizing of chemicals, investigation of hazards, and labelling in 2014 as one of the important actions for chemical management. Although the hazards of banned chemicals and POPs substances have been announced, the public awareness on those substances has not been widely increased so far. As mutual cooperation with relevant ministries, the MOPFI is mainly communicating with MONREC for environmental related matters including POPs survey, MOEE for the inspection about PCBs in transformer oil, YCDC/MCDC/NCDC for the survey of dioxin and furan, respectively.

#### **2.3.11.2.5 Ministry of Electricity and Energy**

The Ministry of Electricity and Energy (MOEE) is a major ministry of handling POP substance (PCBs) which are mainly contained in the transformer oil. According to survey, the used transformer oils are stored only in ware-houses and store houses.

Engineers and Staffs under the ministry are trained to understand about the hazards and ways to manage in environmental sound manner of PCBs.

#### **2.3.11.2.6 Ministry of Commerce**

The Department of Consumer Affairs is set up under the Ministry of Commerce. The Region and State Headquarters are also being formed and are taking action in accordance with the Consumer Protection Law if there is a loss of consumer rights and interest and effectively handling consumer protection activities. In addition, field inspections are conducted to ensure the safety of goods or services in the market and consumer protection education and information delivery in states, regions and union territory region. As Myanmar is a member of the ASEAN Consumer Protection Committee, it has been implementing the ASEAN Consumer Protection Strategy (2016-2025). Consumers can complain by letter or by phone or by phone. The Consumer Information and Complaint Center (CICC) is set up at state and district offices for easy and fast complaints and can be lodged through the WebPage [www.doca.gov.mm](http://www.doca.gov.mm) and the CICC - Nay Pyi Taw Facebook Page and via DOCA Myanmar Mobile Application. In addition, the Union Territory, state and regional offices have been expanded to provide more consumer protection knowledge and conferences, seminars and workshops are being conducted. Consumer protection related booklet and brochure has been issued once a year to inform consumers about the process and issues related to consumer protection. The World Consumer Rights Day has been held since 2016, with the fourth edition being successfully held on March 15, 2015 in Patheingyi, Irrawaddy Region. Capacity building and awareness raising activities have been conducting according to the one of the eight fundamental rights of the United Nations, " To have a better living standard and environment for the present and future generations. " and the Consumer Protection Guidelines of the United Nations , "To be informed about the development of sustainable consumption patterns and the consequences of consumers' choices".

#### **2.3.11.2.7 Ministry of Health and Sports**

The Ministry of Health and Sport (MOHS) is also one of the relevant Ministries which have the potential handling of dichlorodiphenyltrichloroethane (DDT) substances in their public health intervention process in the past in vector-borne disease control. The activities related to public awareness and risk assessment on POPs is limited. However, all the Standard operation procedures (SOPs), guidelines and policies related to chemicals in health care sectors are developed according to relevant policies, laws and conventions in Myanmar.

#### **2.3.11.2.8 Ministry of Education**

The Ministry of Education (MOE) is also one of the major ministries which may play a vital role for sharing POPs information to the students and public. Currently, the MOE distribute the information through television programs and government newspapers. In future, the MOE plans to cooperate with MONREC to perform environmental conservation programs such as plantation in raining season at schools and universities. Also, the students from universities are intended to be involved in the projects, research works and training course related to environmental and disaster affairs such as flood management.

#### **2.3.11.2.9 Yangon City Development Committee**

Yangon City Development Committee (YCDC) plays a vital role for solid waste management of Yangon City. The YCDC uses the television media, interviews, posters, calendars, pamphlets for distribution the knowledge of solid waste storage and disposal ways to the public. The YCDC arrange school awareness activities of solid waste management to school children in order to make the best practice of solid waste management since childhood. Also, it organizes community awareness activities of solid waste management in order to raise public aware and interests in participation of solid waste management programs. The staffs under the YCDC have been educating by a responsible officer about POPs information.

#### **2.3.11.2.10 Union of Myanmar Federation of Chambers of Commerce and Industry**

The Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI), is a national level non-governmental organization representing and safeguarding the interests of the private business sector in Myanmar. It was established in 1919, UMFCCI comprises 16 Regional and State Chambers' of Commerce and Industry, 9 Border Trade Associations, 48 Affiliated Associations and about 30,000 members. The UMFCCI supports the business communities by sharing knowledge, expertise and opportunities. Also, the UMFCCI provides include human resource development training, trade information, business facilitation, business matching and consultancy, trade fairs, seminars, workshops, forum and study tours. Currently, the UMFCCI has no budget for sharing public information. It generally conveys the business information through brochures, annual meetings, and trainings. With the support of JICA, there are some conferences, training courses. The UMFCCI is collaboration with ECD for information distribution. However, the UMFCCI has no experience of dissemination of POPs information to the relevant industry yet. On the other hand, it has the activities related to the Globally Harmonized System (GHS) practices to the industries.

### **2.3.11.2.11 Agriculture, Market and Information Agency**

The Agriculture, Market and Information Agency (AMIA) was organized in January 2015 and it was a freelance promoter for value change real development project. After completion of the project, it still stands as freelance organization to support peasants and farmers by dissemination of agricultural information and market information. It is under collaboration with NGOs like Myanmar Fruit, Flower and Vegetable Producer and Exporter Association (MFVP), and Department of Agriculture. The AMIA regularly announces such information/news/programs/ interviews at private and government daily newspapers, weekly journals, agricultural mobile application, online news media, Sky Net Television Channel, Myanmar Radio Channel, and 1883 Telecommunication Hot Line. It daily uploads the information such as crop price, cultivation methods, insects and pests information, pesticides information on Facebook Page as well as on YouTube. Moreover, it held one public lecture of agricultural public service announcement (PSA) with more than 100 audiences in February 2016. It broadcasts a demonstration program for systematic use of pesticides on MRTV. And it broadcasted a program of cultivation techniques on Shwe FM Radio Channel for one year. Hence, the AMIA actively focused on public dissemination activities particularly for agricultural information.

### **2.3.11.2.12 Consumer Protection Association of Myanmar**

The Consumer Protection Association of Myanmar (CPA) was organized on 26 August 2012 with the valuable purposes particularly; to protect the consumers from the hazards of chemicals containing in the foods and commercial goods as well as to protect citizen right to know by ourselves. Nine (9) branch offices of the CPA are located all over Myanmar (Yangon, Mandalay, Naypyitaw, Bago, Taunggyi, Pakokku (2) Nos, Daik-U, Bilin). This Association has been working cooperation with the government departments and organization (Townships Municipals under YCDC, Myanmar Police Force, Ministry of Education, Department of Small and Medium Enterprises Development).

Since 2012, the Association constantly distributes the consumer protection information through Radio Channels (Mandalay FM, VOA, RFA, BBC), Television Channels (MRTV-4, Skynet, DVB, 5 Network, Myawaddy), Printed Media (Journals: Democracy Today, Myanmar Times, Yangon Times, Flower News, The Voice, 7 Days, Ayeyarwaddy, Myanmar Post Global, Bullet, News Watch; Newspapers: The Mirror, The New Light of Myanmar; Pamphlets; Social Network (Facebook, Websites). The Special Talks have been held at Basic Education Schools (more than 100 times) by the Association. The School Principals consequently educates the students and manage to avoid the hazardous food at school stalls. Moreover, the Association provides lectures to the individuals free of charge with the objective of reducing poverty. The lectures particularly encourage complying with WHO standards for foods manufacturing industries; not to use the banned chemicals in the manufacturing of foods and commercial

products; to produce the organic foods as much as possible. In order to improve the capacity of the members of the Association, the trainings such as consumer rights course, the course of the protection from the hazards of chemicals, rules and regulations study course are organized for the members.

### 2.3.11.3 Collaboration among the Governments and Stakeholders

The collaborative work among governments, NGOs, research and academic institutions, and communities, on distribution of the POPs information is very limited for the time being. Hence, it is required to develop communication network between government ministries and stakeholders for sharing POPs related information as a first approach for implementation of the Convention.

### 2.3.11.4 Present public information tools, techniques and mechanisms for disseminating environment related information (brochures, fact sheets, media coverage, environmental publications, internet)

In the regards of environmental related information, the MONREC commonly announces the environmental information on Myanmar Radio and Television (MRTV), Myawwaddy Television (MWD), SkyNet Channels, Weekly Journals (Eleven, Seven Days and Pyi Myanmar). In addition, POPs related information are printed on brochures, handbooks, and ministry website. In addition, the MONREC disseminates POPs related information by arranging project related workshops (e.g., POPs EA Project and Project on Management of Hazardous Wastes in Myanmar cooperation with Swedish Environmental Protection Agency) to which the relevant organizations and stakeholders are invited.

The following table listed the current information dissemination tools, techniques, mechanisms used by the relevant stakeholders.

**Table 33. Current information dissemination tools, techniques, mechanisms used by the relevant stakeholders**

No.	Ministries / NGOs	Dissemination Tools / Techniques / Mechanisms
1.	Ministry of Natural Resources and Environmental Conservation	Radio and Television Media, Printed Media (journals), Printed materials (brochures, handbooks), Internet (web portal), Workshops
2.	Ministry of Information	Radio and Television Media, Printed Media (government newspaper), Printed materials (wall paper, brochures), Internet (web portal, Facebook), Photo Contest, Special Talks
3.	Ministry of Agriculture, Livestock and Irrigation	TV Channel, Journals, Call Center via Internet, Ministry Webpage, Training Courses
4.	Ministry of Planning and	News Media, Printed Materials (Myanmar Industry Digest, etc.),

No.	Ministries / NGOs	Dissemination Tools / Techniques / Mechanisms
	Finance and Industry	Poster, Journals (Commerce Journal, Golden Industry Journal), Newspaper, Internet Website
5.	Ministry of Electricity and Energy	Radio and Television Media, Printed Media (journals), Special Talks in schools, Vinyl Board at offices, markets, road junctions
6.	Ministry of Commerce	News Media
7.	Ministry of Health and Sport	News Media
8.	Ministry of Education	Academic Article Publication (Environmental Toxicology Research Papers and Publication)
9.	Yangon City Development Committee	News Media, Interviews, Posters, Calendars, Pamphlet
10.	Agriculture, Market and Information Agency (AMIA)	Radio and Television Media, Printed Media (journals, Newspaper), Printed materials (brochures, handbooks), Internet (web portal), Workshops, Social Media/Network (Facebook, YouTube)
11.	Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI)	Printed Materials (Brochures), Trainings
12.	Consumers Protection Association (CPA)	Radio and Television Media, Printed Media (journals, Newspapers, Pamphlets), Social Network (Facebook, Websites), Special Talks at Schools, Trainings

#### **2.3.11.4.1 Requirements for public consultation related to Environmental Impact Assessment (EIA)**

In Myanmar, the MONREC recently issued the Environmental Impact Assessment (EIA) Procedure in December 2015.

The Article 13 of EIA Procedure describes that the Project Proponent shall arrange for appropriate public consultation through all phases of the IEE and EIA process as required by Articles 34, 50, and 61 of this Procedure, and shall timely disclose to the public all relevant Project-related information in accordance with this Procedure except that which may relate to National Security concerns as informed by the Ministry.

The Article 34 and Article 50 state that the Project Proponent shall undertake the following public consultation process in regard to an IEE Type Project and Scoping process of an EIA Type Project:

- (1) immediately upon commencement of the IEE, disclose relevant information about the proposed Project to the public and civil society through the Ministry and/or Department website(s) and local media, including by means of the prominent posting of legible sign boards at the Project site which are visible to the public, and comply with technical guidelines issued by the Ministry and;

- (2) arrange the required complement of consultation meetings as advised by the Ministry, with local communities, potential PAPs, local authorities, community based organizations, and civil society, and provide appropriate and timely explanations in press conferences and media interviews.

The Article 61 describes that as part of the EIA investigations, the Project Proponent shall undertake the following consultation process:

- (1) timely disclosure of all relevant information about the proposed Project and its likely Adverse Impacts to the public and civil society through local and national media, the website of the Project Proponent, at public places such as libraries and community halls, and on sign boards at the Project site visible to the public, and provide appropriate and timely explanations in press conferences and media interviews;
- (2) arrange consultation meetings at national, State / Regional / Nay Pyi Taw Union Territory and local levels, with PAPs, authorities, community based organizations and civil society;
- (3) consultations with concerned government organizations including the Ministry, the concerned sector ministry, regional government authorities and others and;
- (4) arrange field visits for the Ministry and concerned government organizations.

#### **2.3.11.4.2 Assessment of environment as public priority and effectiveness of information pathways, programs, practices, and tools**

In Myanmar, the printed media such as newspapers, journals, etc. is observed as a primary and major tool, the most useful tool, for distribution of any information including environmental information. Parties/stakeholders use the printed media to share the environmental related information to the public. As a second practice, it is founded that the parties organize the seminars, workshops, trainings, and special talks to convey the environmental related information to the target groups of people such as the staffs under ministries, students, stakeholders, etc. Dissemination through television channels, printed materials such as wall paper, brochures and pamphlets, calendar, poster, etc., and Internet webpages such as facebook, youtube, call center on web, and own webpage, are the third most useful information pathways. Some parties are utilizing the FM Radio Broadcastings as one of the information distribution pathways. Other types of techniques like arranging photo contest and ceremony, and posting vinyl board at the visible area, etc. have been used by the few parties. Even the announcement in newspapers/journals, according to the survey, was seen as the most common method for conveying information to the public, the people who are able to access and read the printed news media are not as many as the people who can listen the FM radio channels.

The current survey indicated that only the few parties utilize this information tool of broadcasting from the FM Radios with the percentage of just over ten out of all information pathways. From the aspect of accessibility by the public, however, the broadcasting from the FM Radios probably would be supposed as the most effective information tool as compared to other tools, and pathways since the public in both urban and rural areas of the country are simply able to access the FM Radios broadcasting. Presently, there are totally 69 FM Radio Stations of nine FM Radio channels (Myanmar Radio, City FM, Mandalay FM, Shwe FM, Padamyar FM, Thazin FM, FM Bagan, Cherry FM, Pyinsawadi FM) all over Myanmar, and 43 FM Radio Stations are going to commence the broadcasting soon. It can be expected that this information tool should be considered as the most effective tool for distribution of POPs information to the public in future.

### **2.3.12 Mechanism to report under Article 15 on measures taken to implement the provisions of the convention and for information exchange with other parties to the convention**

#### **2.3.12.1 Background**

Republic of the Union of Myanmar has ratified the Stockholm Convention on Persistent Organic Pollutants (POPs) on 19 April 2004 and acceded to the Stockholm Convention on POPs in July 2004. As Myanmar became a party to the Stockholm Convention, Myanmar has participated regularly in the Conference of the Parties (COPs) to the Stockholm Convention. Moreover, under Article 15 of the Stockholm Convention, party to the Convention are required to report to the COP on the measures which have been taken to implement the provisions of the Stockholm Convention and on the effectiveness of such measures in meeting the objectives of the Convention. Myanmar had reported second round and third round reporting pursuant to article 15 of the Stockholm Convention via electronic reporting system to the COPs to fulfil the obligations of the Stockholm Convention. According to Article 15, parties are required to report in order to meet the objectives of the Convention.

#### **2.3.12.2 Country reporting**

The Conference of the Parties (COPs) by its decision SC-1/22 decided that in accordance with Article 15 of the Convention, each party should submit its first report by 31 December 2006 for consideration by the Conference of the Parties. The Conference of the Parties at its fourth meeting, by its decision SC-4/30 decided that each Party shall submit its second report pursuant to Article 15 to the Secretariat by 31 October 2010. The Conference of the Parties also decided that each Party shall submit its subsequent reports every four years thereafter for the consideration of the meeting of the Conference of

Parties. The national reports shall be submitted every four years according to following reporting deadlines.

- (1) 1<sup>st</sup> round: 31 December 2006, which was extended to 31 July 2007;
- (2) 2<sup>nd</sup> round: 31 October 2010, which was extended to 31 July 2011;
- (3) 3<sup>rd</sup> round: 31 August 2014, which was extended to 31 August 2015;
- (4) 4<sup>th</sup> round: 31 August 2018.

Regarding the reporting on the implementation of Stockholm Convention, Myanmar missed first round reporting to Convention and started the second round reporting in order to nominate as the Official Contact point and National Focal Point of Myanmar in December 2010. Moreover, Myanmar was also requested to complete the country's national report using the online questionnaire format. Thereafter, Myanmar submitted its national report through electronic reporting system of Stockholm Convention on 28 July 2011 when the deadline for submission of the national report was 31 October 2010, which was extended to 31 July 2011. This reporting document consists of four sections (Part A, B, C and D). Myanmar answered second round reporting online questionnaire

In the third round reporting on the implementation of Stockholm Convention, Myanmar submitted its national report through electronic reporting system of Stockholm Convention on 3 July 2014 when the deadline for submission of the national report was 31 August 2014, which was extended to 31 August 2015. This reporting also contains four sections (Part A, B, C and D).

### **2.3.13 Information exchange mechanism**

#### **2.3.13.1 Background**

The Article 9 of the Stockholm Convention states that each Party shall facilitate or undertake the exchange of information relevant to:

- (1) The reduction or elimination of the production, use and release of persistent organic pollutants; and
- (2) Alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs.

The Parties shall exchange the information referred to in paragraph 1 directly or through the Secretariat. Each Party shall designate a national focal point for the exchange of such information. The Secretariat shall serve as a clearing-house mechanism for information on persistent organic pollutants, including information provided by Parties, intergovernmental organizations and non-governmental organizations. For the purposes of this Convention, information on health and safety of humans and the environment shall

not be regarded as confidential. Parties that exchange other information pursuant to this Convention shall protect any confidential information as mutually agreed.

### **2.3.13.2 Information exchange with other parties to the convention**

The Questionnaire on Technical Assistance and Technology Transfer needs for (2012-2013) was duly filled up by Environment Division, Planning and Statistics Department, Ministry of Environmental Conservation and Forestry and had been sent to the Secretariat of the Basel, Rotterdam and Stockholm Convention on 13<sup>rd</sup> March 2012 as the requirement of submitting information pursuant to decision SC-5/20 on Technical Assistance. National Focal Point

The Environmental Conservation Department (ECD) is the national focal point on exchange of information on POPs for the Stockholm Convention and also the Executing Agency for Persistent Organic Pollutants Enabling Activities Project in Myanmar.

The Environmental Conservation Department is formed under the Ministry of Natural Resources and Environmental Conservation with its regional offices in various Regions and States which are performing their functions and duties to protect and conserve the environment and also to mitigate negative impacts from hazardous waste and related substances including POPs.

Other main relevant Ministries and associates are Ministry of Agriculture, Livestock and Irrigation, Ministry of Planning, Finance and Industry, Ministry of Electricity and Energy, Ministry of Commerce, Ministry of Health and Sports, Ministry of Home Affairs, Ministry of Education, Ministry of Transport and Communication, Nay Pyi Taw Development Committee, Yangon City Development Committee, Mandalay City Development Committee and NGOs.

Currently, ECD serves as National Focal Point by providing updated information nationally as well as internationally by the link ([www.ecd.gov.mm](http://www.ecd.gov.mm)). In the future, POPs related information such as status of measures to fulfil the obligations of the Stockholm Convention, activities regarding measures of reduction or elimination of the production, use and release of POPs, conference, workshop and seminar will also be disseminated online. Interested persons will be kept abreast of developments on issues of POPs. Therefore, the National Focal Point will also act as a link between the Convention Secretariat, other Parties to the Convention and national stakeholders.

### **2.3.14 Relevant activities of non-governmental stakeholders**

Data of Non-Governmental stakeholders related with POPs is assessed from the members of 6 Inventory Task Teams, especially from Myanmar Industrial Association, Myanmar Chemical Engineering Group and UMFCCI. Moreover, lists of the related Non-

Governmental Organization are collected from Foreign Economic and Relation Department (FERD) under Ministry of Planning and Finance by official letter of ECD under MONREC. In Myanmar, there are total 979 Non-Governmental Organizations registered at Ministry of Home Affairs. Major NGO Stakeholders which have great potential to be related with POPs are 59 which are especially chemical and environment related organizations in Myanmar. These organizations are self-funded, non-profit making organization with truly private independent body efficiently and effectively cooperation with the Government and other private agencies in the Republic of the Union of Myanmar. Mission of these organizations is to promote, represent and safeguard the environment and community. These organizations have been conducting food safety, chemicals and waste management related capacity building and awareness raising program for Universities and Industries by successful collaboration with relevant government, associations and organizations to provide technical transfer, knowledge sharing opportunity and networking cooperation platform in Myanmar. Currently, Myanmar has been ongoing cooperation with supports from international organization in term of taking inventory for database development and technology transfer for sound environmental management program. In these cases, NGOs and stakeholders play a vital role and also challenges of POPs need to be solved by cooperation with relevant sectors including government and private.

### **2.3.15 Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, research and development – linkage to international programmes and projects**

Regarding technology development in Myanmar, it has been underdeveloped because of various reasons such as political uncertainty, corruption, impact of climate change, highly dependence on natural resource extraction and the agriculture sector. However, it has an undeniable geographical advantage located right between technologically developed countries such as India and China. Therefore, it is a great opportunity to exchange technology transfer for predominantly young generation with latecomer advantage to experience and benefit from proven technology. Currently, Myanmar relies on existing technologies at international and regional levels. And it also needs enabling policies, regulatory frameworks and adequate capacity to access new innovative technologies. The generation of knowledge on technology and innovation related to chemical and waste management especially those which can lead to circular economy is vital. But there are a few of researches, articles and findings on these areas in Myanmar. Since successful adaptation depends largely on location and context-specific narratives on vulnerability, filling these research gaps is a priority. But scientific research can be quite demanding in terms of both human resources and finance. So Myanmar may first focus on collaborating with international research, which will also help to develop Myanmar's researchers' capabilities on various aspects of areas. Once a critical mass of

trained researchers is available, the country can undertake its own follow-up research through inter-agency collaboration.

Regarding current educational infrastructure in Myanmar, there are 194 universities administered by the Ministry of Education in Myanmar in 2019.

Current Health Monitoring Capacity in Myanmar is that current policy direction in the health sector focuses on ‘health for all’ via decentralized healthcare services that will prioritize vulnerable communities. The health policies (2009) and National Environment and Health Action Plan (2010), focus on protection, preventative and curative measures, public fitness, research, financing, nationwide health services, multi-stakeholder and international engagement to increase health safety and create a healthy environment for the population. Access to health infrastructure and improved institutional structures within the health sectors play an important role in raising awareness and building capacity. Myanmar has 20 national hospitals and 32 state and regional hospitals; the WHO has supported the establishment of these hospitals since 2006. The Department of Health raises awareness through newspapers, TV advertisements and posters to promote behaviour change. Myanmar has made significant progress in health sector. For example, under-five child mortality fell from 10 to 5.2 per cent between 1990 and 2010. (ADB 2015)

Regarding current government owned and private owned laboratories infrastructure in Myanmar, there are 17 government owned laboratories under seven Ministries such as Ministry of Agriculture, Livestock and Irrigation (MOALI), Ministry of Education (MOE), Ministry of Planning Finance and Industry (MOPFI), Ministry of Natural Resource and Environmental Conservation (MONREC), Ministry of Health and Sports (MOHS), Ministry of Electricity and Energy (MOEE) and Yangon City Development Committee (YCDC) and 6 private laboratories located in Yangon, Myanmar. Major equipment used at laboratories are X-Ray Fluorescence (XRF), Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-OES), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), Scanning Electron Microscope (SEM), Atomic Force Microscopy (AFM), Biological Microscope, Moisture Analyzer, Gas Chromatography Mass Spectrometry (GC-MS) , Fourier-Transform Infrared Spectroscopy Near-Infrared Spectroscopy (FTIR-NIR), High-performance Liquid Chromatography (HPLC), Ultraviolet–Visible Near-Infrared Spectroscopy (UV-Vis-NIR), Flash Point Tester, Density Meter, Carbon/Sulfur Analyser, Oxygen/ Nitrogen/ Hydrogen Analyser, X-Ray Diffraction (XRD) etc.

## **2.3.16 Overview of technical infrastructure for POPs management and destruction**

### **2.3.16.1 Waste management including POPs management and destruction**

Current Waste Management Facilities and Infrastructure in Myanmar are traditional waste collection and disposal in Myanmar which have been the responsibility of the respective cities. In Yangon, Mandalay and Nay Pyi Taw, autonomous City Development Committees (CDCs) and their Pollution Control and Cleansing Departments (PCCDs) with their network of administrative branches and sub-units are tasked with waste management in their administrative boundaries. In other parts of the country, respective Township Development Committees (TDCs) are responsible for managing waste collection and disposal.

There has not been a particular POPs stockpile management activity in Myanmar yet and therefore there is not a particular capacity to manage POPs waste like PCB oils or POPs pesticide stockpiles. Current waste management practices and facilities are inadequate and current infrastructure for destruction of POPs in Myanmar is also limited.

Current available waste management facilities in Myanmar are as follows;

- (1) Golden Dowa Ecosystems Private Limited, inside the Thilawa SEZ is a waste management company, under DOWA Holdings, Japan. The facility constructed with an investment of 36 million USD and spread over 42 ha, is currently receiving wastes from operating industries inside Thilawa SEZ and from few multinational oil and gas industries. Most wastes received are non-hazardous in nature; hazardous wastes are heavy metals and oil containing wastes. The company is discussing with YCDC for extending services to industrial zones in Yangon. The facility has the controlled secured landfill for hazardous and non-hazardous wastes constructed following the United States Environmental Protection Agency (USEPA) standard, covered sorting/stabilization shed, wastewater and leachate treatment facility, waste laboratory and oil wastes handling system. There is a demarcated area for installation of incinerator and material recovery facility in future. It is planning a comprehensive treatment park for liquid hazardous waste in Yangon, comprising all the processes needed to treat the liquid wastes.
- (2) Myanmar Port Authority Industrial Engineering Department is cooperating with MECH COOL Co.,Ltd to carry out systematic treatment and disposal of Oily Bilge Water (MARPOL ANNEX 1) service in large vessels and issuing the license as the Port Reception Facility Service Provider for international shipping vessels which contains various types of oil, dangerous goods, plastic and solid waste which are properly disposed according to the International Convention for the Prevention of Pollution from Ships (MARPOL73 / 78).

- (3) Cement kiln especially newly built dry process kiln lines which are modern and best available technique (BAT) kilns are also one of the options to destruct POPs stockpile in Myanmar. It will be worthwhile for Myanmar to investigate the feasibility of utilising cement kilns for efficient destruction of hazardous wastes like ODS chemicals and POPs and plastic fractions in such BAT cement plants.
- (4) Myanmar has a BAT waste incinerator which needs to be assessed in future to what extent they could be used for the destruction of some of the POPs containing wastes and stocks. This need to be included the assessment of cost.

### **2.3.16.2 Capacity and infrastructure for contaminated sites assessment, securing and remediation**

During the NIP development, initial assessment of pesticide contaminated sites has been made including sampling of soils and analysis of selected POPs pesticides.

A detailed assessment of POPs pesticides have not been made and there is currently no capacity in the country for detailed assessment of POPs contaminated sites and the remediation of POPs contaminated sites.

### **2.3.17 Identification of impacted populations or environments**

An initial survey on health effects in potentially POPs exposed population was made. In likely or potential 629 POPs exposed population, about age, sex, marital status, services, number of children, smoking status, alcohol drinking status, personal protective equipment (PPE) wearing status, medical history of exposed population, medical history of family members were interviewed. The following exposed groups were selected:

- (1) Polychlorinated Biphenyls (PCB) impacted population inventory was conducted by interviewing 59 workers who may have been exposed to transformer oil used at power stations;
- (2) Health impact of Hexabromocyclododecane (HBCD) was also conducted by assessing two EPS producing factories for insulation boards used in building construction;
- (3) Dichlorodiphenyltrichloroethane (DDT) impacted population (163 workers) were interviewed in an industry where DDT was sprayed during its construction in 2009;
- (4) Dioxin and furan impacted population interview was conducted for workers who worked in possibly dioxin and furan emission industries in Mandalay region;

- (5) Also workers in polyurethane (PUR) foam industry where insulation boards are produced for building construction were interviewed, where PBDEs use were suspected but not verified;
- (6) POPs pesticides impacted population inventory was conducted by interviewing and medical examination of population who might have been exposed to POPs pesticides at four villages in Hintada Township and Ayeyarwaddy region. The agriculture workers in this survey had the history of using POPs pesticides at their farms mostly aldrin and deldrin in cabbage in the last 25 years. These POPs pesticides were used in cabbage, flower and bean farms.

POPs can cause infertility. In this survey, 80 married persons had no children and this may be due to infertility due to POPs (e.g. Pesticides) or other reasons. Smoking, betel chewing and alcohol drinking are risk factors for cancer and these habits were also recorded. Among 346 POPs exposed male persons, 160 (46.24 %) male persons smoked cigarette daily and the rest did not smoke. In among 283 female persons, 21 (7.42%) smoked cigarette daily and the rest did not smoke. Among 346 POPs exposed male persons, 120 (34.68%) male persons drank alcohol daily and the rest do not drink. Among 346 POPs exposed male population, 199 (57.51%) persons have the habit of betel chewing and the rest has no habit. In among 283 POPs exposed female population, 54 (19.08%) persons have the habit of betel chewing and the rest has no habit. It was noted that most of interviewed population use PPE improperly and irregularly.

In 203 POPs pesticides exposed population, 13 workers suffered dizziness and 16 workers suffered abortion, 2 family members suffered breast cancer and 1 family member suffered larynx cancer. In 163 of dichlorodiphenyltrichloroethane (DDT) exposed population, 13 workers had no child. These effects are similar to the health effects caused by POPs pesticide exposure. However, no conclusions could make that these effects are due to POPs pesticides because it could not be measured the biomarkers of POPs pesticides and the amount of exposure of pesticides could not be known. Most of the farms were near home and most of the workers washed their clothes wearing at the time of working at home and that may cause further exposure of pesticides to family members.

Among 629 workers with potential exposure to POPs, 76 suffered from hypertension, 38 suffered from muscle stiffness, 6 had muscle weakness, 15 suffered from tinkling and numbness of lower limb, 20 developed dizziness, 25 had gastritis, 46 suffered from joint pain, 14 had back pain, 1 had epilepsy, 21 suffered from ischemic heart disease, 6 had bronchitis, 11 developed asthma, 17 had tuberculosis, 3 suffered from hyperthyroidism, 7 had goitre, 2 had dermatitis, 17 had abortion, 11 suffered from diabetes mellitus, 6 developed nephritis, 1 had renal stone, 11 suffered from viral hepatitis, 5 had stroke, 7 had malaria, and 2 suffered from typhoid. The most frequent disease was hypertension, 76 workers suffered from this disease.

Among 1982 family members with likely exposure to POPs, 43 suffered from hypertension, 16 suffered from stroke, 4 had tinkling and numbness of lower limb, 7 suffered from joint pain, 2 got epilepsy, 16 had ischaemic heart disease, 16 developed tuberculosis, 2 suffered from bronchitis, 6 developed asthma, 2 had breast cancer, 1 had larynx cancer, 15 suffered from diabetes mellitus, 4 suffered from gastritis, 2 developed malaria, 2 had nephritis, 2 had hepatitis, 2 suffered from psychiatric problem. The most frequent disease was hypertension and 43 family members suffered from this disease.

In this survey no POPs monitoring in workers or the potentially impacted family members was conducted due to the lack of analytical capacity. Also the number of participants was relatively small to do a statistical assessment. Therefore it is difficult to make correlation to conclude on the effect of POPs on the respective health effects in this initial assessment. The survey however showed that several occupation and family members are likely exposed to POPs and further assessment is needed.

### **2.3.18 Details of any relevant system for the assessment and listing of new chemicals**

Regarding description of current registration system of new chemicals, following instructions are responsible to approve certain chemicals.

The average total consumption of pesticide in Myanmar is still low when compared to that in neighbouring countries. Most of the pesticides used in the country are imported as formulated products. Technical grade pesticides are not manufactured but formulated in pilot formulation plant established with assistance from UNIDO in 1984. Department of agriculture was responsible for procurement and distribution of agriculture used pesticide as a monopoly position before 1990 when no pesticide regulation was enacted. The agricultural use contributes over 90 percent of total and the other for vector control purpose. The department of health is responsible for procurement of insecticide and rodenticides for public health and vector control program. Most of pesticide imported and used until 1990 are organochlorine pesticides which endrin, dichlorodiphenyltrichloroethane (DDT), lindane, aldrin and dieldrin. Aldrin and dieldrin were widely used in pests' control of groundnut and rice in fields whereas endrin is very favourite among farmers as an effective insecticide for wide spectrum used. Lindane and dichlorodiphenyltrichloroethane (DDT) were applied in both agriculture and public health.

Any companies (Foreign or local companies) desirous of imported and formulated pesticide and active ingredients to control the agricultural pests as domestic use shall apply the pesticide registration to the Pesticide Registration Board.

The pesticide registration shall send the required information in english in three copies. It is the responsibility of the applicant applying for registration or having a product registered, to state any additional data or information which are considered relevant for the

efficient and safe use of its product, and should be taken into account during the registration procedure and at the time of field application.

The laboratory fee for the registration of the sample applicant must submit the application form (PLF-1) to the cashier of the agriculture division and submit the required documents along with the application as follows;

- (1) Complete the application form (PLF-1) payable with the respective fees;
- (2) The secretary of Pesticide Registration Board office will check the completed application form and technical dossiers will be contributed to respective technical members;
- (3) The pesticide laboratory analyses and test pesticides or any active ingredient received as samples to confirm with the content of ingredient as claimed on the label;
- (4) The technical committee, under the Plant Protection Division, evaluates the technical documents;
- (5) With the pesticide analytical results and the review on the technical documents, the external technical meeting shall evaluate the pesticide;
- (6) According to the results of the evaluation, the pesticide is submitted to the Pesticide Registration Board;
- (7) The Pesticide Registration Board shall make decision with respect to the application for the following type of registration;
  - (a) Experimental registration;
  - (b) Provisional registration;
  - (c) Full registration;
  - (d) Amended registration;
  - (e) Special use permit.
- (8) The secretary of Pesticide Registration Board (PRB) issue the letter to the companies to deposit the respective registration fees in Myanmar kyat.

The secretary of Pesticide Registration Board (PRB) is the director general of Department of Agriculture (DOA).

The PRB meeting is conducted once or twice per year. Preparatory technical review is done within Plant Protection Division (PPD) together with technical members from other Ministries.

Technical Committee (TC) for pesticide registration is formed constituent with environmentalist, toxicologist, entomologist, pathologist, weed scientist, analytical chemist and IPM specialist to evaluate on the efficacy, occupational health and safety, residue monitoring and supervised trial, environmental hazard and risk assessment and the

quality of pesticide. The director of Plant Protection Division is secretary of technical Committee.

Regarding registering of new pesticides, registration scheme requires reliability of tests and evaluation in the scheme.

Applicants need to submit technical and administrative data for registering new pesticides. PPD checks crucial items (e.g. acute toxicity),

Pesticide applicants have to conduct the effectiveness and phyto-toxicity test in soil sampling sites by themselves in Myanmar when they register pesticides. Testing of the soil sampling sites is conducted under the supervision of PPD's technical experts and the test results are being evaluated.

Current Legal basis and implement agencies are as follows;

- (1) Pesticide law (1990, 1st amended January 2016);
- (2) Procedures relating to the pesticide law, Ministry of Agriculture and Forests Notification No. 4/1991;
- (3) According to the new pesticide law, procedures relating to the Pesticide Law is issued by Ministry of Agriculture, Livestock and Irrigation Notification No. 2/2019;
- (4) Pesticide Registration Board (1992);
- (5) According to the new pesticide law, new Pesticide Registration Board (PRB)

PRB was held 29 times and 3801 pesticide brands were registered. PPD is currently responsible for monitoring and management of pesticides and pesticide registration matters.

It is necessary for amending these schemes to meet the requirements of the convention. Following are short review of how the identified schemes could be amended if necessary. One of the present problems is to control the illegal pesticides crossing the border without a proper registration and some retailers are selling mixed, fake or illegally repacked pesticides. With regard to the international instruments for pesticide management, Myanmar is a Party of the Stockholm Convention on Persistent Organic Pollutants and also of the Montreal Protocol on substances that deplete the Ozone Layer. Although a number of obligations are more or less fulfilled, for some obligations this is under implementation.

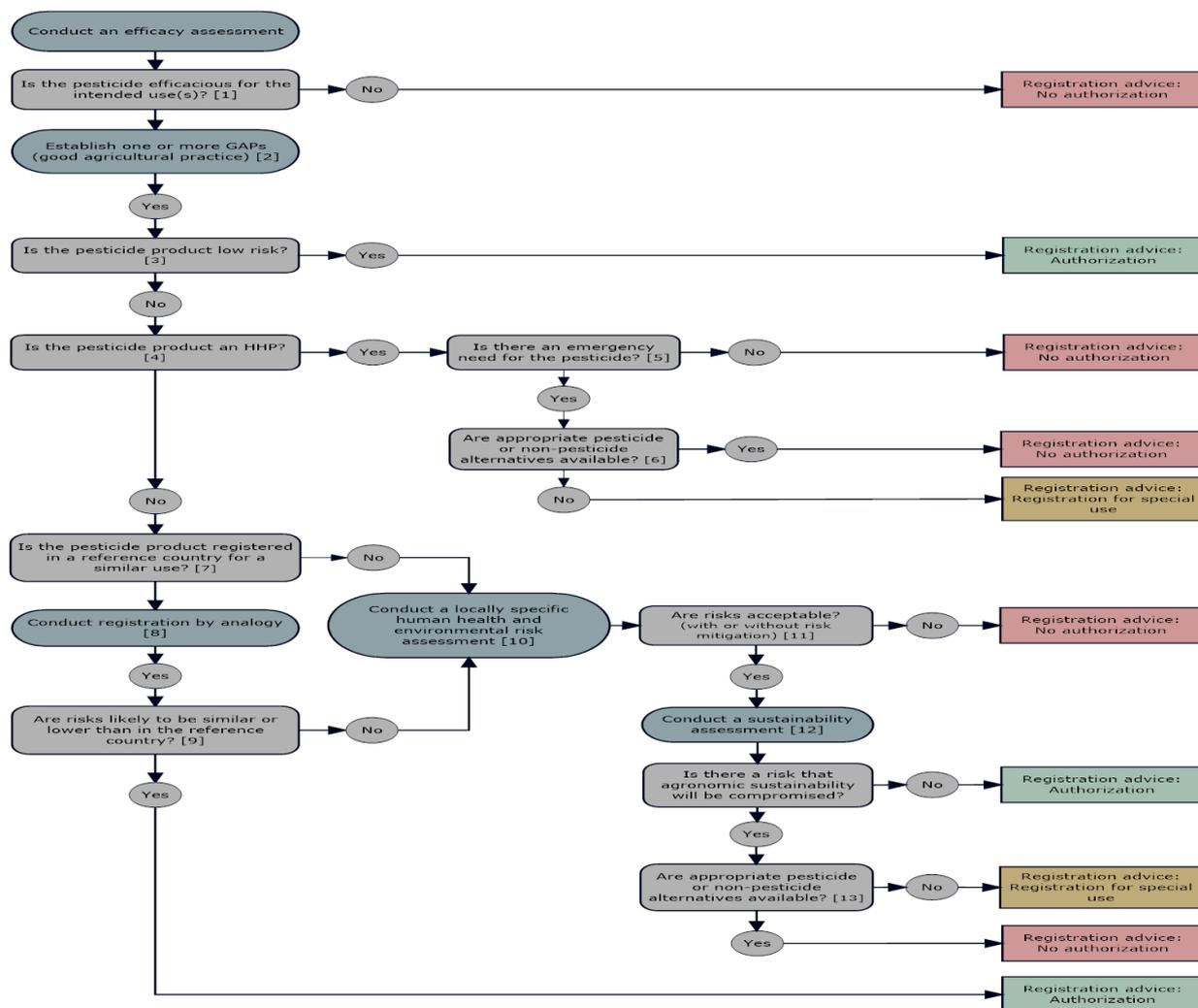
Although Myanmar is not a party of the Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous chemicals and pesticides in international trade, it has the list of banned pesticides and pesticides subject to restrictions. However, Myanmar is a party to the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal since 2015.

- (1) Formation of Pesticide Registration Board (PRB); A new Pesticide Registration Board and new Technical Committee were formed according to the current new pesticide law in 2017;
- (2) There is a restriction for Highly Hazardous Pesticide (HHP) user and only permission is provided to specific license holder who has completed the Certified Pesticide Applicator (CPA) training on safe and effective use of Highly Hazardous Pesticide (HHP). Moreover, banning, restriction, changing of pesticide formulation system has been carrying out meanwhile;
- (3) Import and use of pesticides shall be conducted according to the procedure and any exporters and users must comply with pesticide laws;
- (4) The person who dealing with the pesticide and illegally imported Persistent Organic Pollutants (POPs) pesticide, legal actions should be taken according to the existing pesticide law.

### **2.3.19 Details of any relevant system for the assessment and regulation of chemicals already in the market**

The pesticides currently used in the market have been assessed according to the scheme in Myanmar. The pesticide evaluation procedure is normally conducted before the pesticides are permitted for use. The evaluation scheme does not explicitly mention the assessment of POPs properties but have a particular assessment for highly hazardous pesticides;

- (1) Pesticide Law, Procedure and Registration Board
  - (a) In 1990, the pesticide law covers all pesticides used in agriculture and health sector;
  - (b) In 1991, the procedure relating to pesticide law was issued;
  - (c) In 1992, the pesticide registration board (PRB) was formed and constituent with the representatives from relevant Ministries and in 2006, new pesticides law was enacted and new procedure for new pesticides is under processing by the government.
- (2) Licenses and Permits
  - (a) Pesticide retailers need a license from the regional officers of DOA;
  - (b) In order to get that license they need to have completed Certified Pesticide Applicator (CPA) training;
  - (c) In order to import pesticides, the importing company needs a permit from the Ministry of Commerce which will only provide such a permit after endorsement by Plant Protection Division (PPD).



**Figure 20. Evaluation process for the pesticide registration**

## 2.4 Implementation status

The implementation status and the level of compliance with the SC requirements is compiled with reference to the individual chapters in this NIP detailing the status of individual POPs. The action plans for the new listed POPs and initial POPs are presented in Chapter III.

**Table 34. Implementation status**

No.	Convention Article	Level of compliance	Comments
1.	<b>ARTICLE 3 Measures to reduce or eliminate releases from intentional production and use</b>	For POPs pesticides (see Assessment of POPs Pesticides in Chapter II.)	-
		For PCBs (see Assessment of PCB in Chapter II.)	-

No.	Convention Article	Level of compliance	Comments
		For DDT (see Assessment of DDT in Chapter II.)	-
2.	<b>ARTICLE 4 Register of exemptions</b>	Myanmar is not registered for any specific exemptions, as listed in SC Annexes.	DDT was previously registered to use for disease vector control (2006 - 2016), but withdraw its registration in February 2012.
3.	<b>ARTICLE 5 Measures to reduce or eliminate releases from unintentional production</b>	See Assessment of releases of unintentional produced chemicals in Chapter II.	-
4.	<b>ARTICLE 6 Measures to reduce or eliminate releases from stockpiles and wastes</b>	For POPs pesticides see (see Assessment of POPs Pesticides in Chapter II.)	-
		For PCBs (see Assessment of PCB in Chapter II.)	-
		For DDT (see Assessment of DDT in Chapter II.)	-
5.	<b>ARTICLE 7 Implementation plans</b>	This is the first NIP of Myanmar.	-
6.	<b>ARTICLE 8 Listing of chemicals in SC Annexes A, B and C</b>	Up to now Myanmar has not submitted a proposal on the listing of new chemicals in SC Annexes A, B and C to the COPs.	-
7.	<b>ARTICLE 9 Information exchange</b>	See Information exchange mechanism in Chapter II.	-
8.	<b>ARTICLE 10 Public information, awareness and education</b>	See Current level of information, awareness, and education amount target group; existing systems to communicate such information to the various groups in Chapter II.	-
9.	<b>ARTICLE 11 Research, development and monitoring</b>	See Existing programs for monitoring releases and environmental and human health impacts, including findings in Chapter II.	-
10.	<b>ARTICLE 12 Technical assistance</b>	Myanmar is a recipient developing country Party.	-
11.	<b>ARTICLE 13 Financial resources and mechanisms</b>	Financial resources are needed for the implementation of the Convention.	-
12.	<b>ARTICLE 15 Reporting</b>	Myanmar has sent the second and the third reports pursuant to Article 15 of the Convention on 28/07/2011 and 26/08/2014 respectively.	-

No.	Convention Article	Level of compliance	Comments
13.	<b>ARTICLE 16 Effectiveness evaluation</b>	Up to now Myanmar has not participated in the human milk study or the Global Monitoring Plan.	-
14.	<b>ARTICLE 17 Non-compliance</b>	As the procedures and institutional mechanisms for determining non-compliance are not yet approved and developed, the countries compliance cannot yet be verified.	-
15.	<b>ARTICLE 19 Conference of the Parties</b>	SC focal point (Mr. Hla Maung Thein, Director General of ECD) Myanmar has attended the Stockholm Convention COPs 6, 7, 8 and 9	-
16.	<b>ARTICLE 21 Amendments to the Convention</b>	Myanmar has accepted all the Stockholm Convention amendments	-
17.	<b>ARTICLE 22 Adoption and amendment of SC Annexes</b>	Myanmar has accepted all the Stockholm Convention amendments	-
18.	<b>ARTICLE 24 Signature</b>	Not the case.	-
19.	<b>ARTICLE 25 Ratification, acceptance, approval or accession</b>	Myanmar acceded to the Convention on 19/04/2004.	-
20.	<b>ARTICLE 26 Entry into force</b>	The Stockholm entered into force for Myanmar on 18/07/2004.	-

## CHAPTER III

### 3 Strategy and action plans

Chapter III addresses the formal policy statement and the implementation strategy and action plan for the NIP. The implementation strategy sets out specific action plans or strategies to achieve Convention obligations and other additional objectives set by the country.

#### 3.1 Policy statement

##### 3.1.1 Government's commitment to address the POPs issue

The Government of Myanmar is committed to the effective implementation of the provisions and obligations of the Stockholm Convention on POPs. ECD will cooperate with relevant ministries and departments in implementation of promoting sound management and use of chemicals (including POPs) in order to avoid damage to human health, the ecosystems, and the environment.

The overall objective of the sound management of POPs in Myanmar is to safe life-cycle management, pollution control, reduction, treatment and finally elimination of POPs in Myanmar to meet the requirements of the Stockholm Convention, contribute to protecting human health and environment, toward sustainable development.

Cross cutting objectives are as follows;

- (1) Appropriate institutional capacity, regulatory frame and stakeholder coordination for POPs and hazardous chemical management and substitution;
- (2) Enhanced capacity in science and technology for monitoring, understanding and management of POPs and hazardous chemicals in the life cycle with appropriate knowledge and information management and related infrastructure;
- (3) Broad stakeholder awareness on POPs and other hazardous chemicals, on environmental health problems related to POPs and POPs management solutions (restrict use, replace, phase-out, disposal and destruction);
- (4) Synergistic implementation of relevant conventions and SDGs where appropriate and integration in national chemical and waste management and the sustainable development strategy.

Appropriate actions, activities and strategies prepared in the NIP will be implemented to reduce and ultimately eliminate POPs from the environment as envisaged under the Stockholm Convention. The NIP takes into account the existing work and assessments to form an integral part of the national integrated chemicals and hazardous

wastes management programme in Myanmar. It also takes due account of the aims of the national sustainable development agenda in terms of social, economic and environmental policies and actions in order to maximize their overall benefits. This will avoid “reinventing the wheel” and link the NIP to related national chemicals and waste management initiatives where possible to ensure maximum efficiency and reduce duplication of effort.

Myanmar is aware that POPs are only a part of the sound chemical management task and the hazardous waste management challenge. Therefore, the ECD is aiming to link and harmonize the different activities on chemical (other chemical Conventions and SAICM) and related hazardous waste management (POPs, mercury, ozone depleting substances and plastic).

Also the waste management and the destruction of hazardous chemicals need to be addressed in a holistic manner and should address all type of hazardous chemical wastes and their destruction where appropriate securing co-funding in implementation.

It is Myanmar’s view that dealing with the POPs issues in an integrative manner, as part of country’s framework action plans (chemicals management plans, waste management plans, contaminated sites management, plastic management etc.), will result in an effective implementation, as well as attract international development partners.

### **3.1.2 Endorsement of NIP**

The process of the development of the NIP involved the active participation of broad-base of relevant national stakeholders, including government ministries, departments and agencies; research institutions and academia; non-governmental organizations.

## **3.2 Implementation strategy**

### **3.2.1 Coordination with national plans and inter-ministerial and stakeholder coordination**

The Myanmar Sustainable Development Plan (MSDP) highlight that currently Myanmar has myriad sectoral, ministerial and sub-national plans and that a genuine development will only come to Myanmar if, all these plans move harmoniously and coherently under the aegis of a single national strategy.<sup>73</sup> The MSDP delivers this strategy, providing an overall framework for coordination and cooperation across all ministries, and all States and Regions to forge a common path towards the emergence of a prosperous,

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<sup>73</sup>The Government of the Republic of the Union of Myanmar Ministry of Planning and Finance. Myanmar Sustainable Development Plan (2018 – 2030).

peaceful and democratic Myanmar. The strategy for implementation of the NIP is to mainstream it into the MSDP and support the implementation of the MSDP. There are several goals and related pillars and strategies of MSDP which can be supported by the Stockholm Convention NIP including e.g.:

- (1) GOAL 3 of MSDP: JOB CREATION & PRIVATE SECTOR-LED GROWTH and related strategies. For example by supporting to develop POPs and other hazardous waste management companies or by supporting the development of recycling of waste fractions partly impacted by POPs;
- (2) GOAL 4 of MSDP: HUMAN RESOURCES & SOCIAL DEVELOPMENT FOR A 21ST CENTURY SOCIETY and the related strategies. For example by improving research and education and awareness raising on chemical management and waste management or the development of analytical and monitoring capacity;
- (3) GOAL 5 of MSDP: NATURAL RESOURCES & THE ENVIRONMENT FOR POSTERITY OF THE NATION and related strategies. For example supporting Strategy 5.1<sup>74</sup> “Ensure a clean environment together with healthy and functioning ecosystems” by preventing the contamination of ecosystems to keep them healthy and functioning by protection of the environment from POPs pollution and potentially clean-up areas contaminated by POPs or other highly persistent chemicals.

The NIP has some complementary activities which can even improve the current MSDP. For example the current MSDP does not state explicitly about chemicals or the waste hierarchy of the recovery of resources from waste or the circular economy approach. Here the NIP can positively enrich the MSDP in particular when appropriately mainstreamed with the Myanmar National Waste Management Strategy and Master Plan (2018-2030)<sup>75</sup> and Myanmar National Hazardous Waste Management Master Plan.<sup>76</sup>

Chemicals, wastes and their management are important for a range SDGs of the 2030 Sustainable Development Agenda in particular SDG 12 on sustainable production and consumption. Chemical and waste management also significantly contribute to the implementation of the MSDP in particular for:

- (1) Goal 2 of SDGs: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture;
- (2) Goal 3 of SDGs: Ensure healthy lives and promote wellbeing for all at all ages (specifically Target 3.9: By 2030, substantially reduce the number of

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<sup>74</sup> Strategy 5.1 of MSDP: Ensure a clean environment together with healthy and functioning ecosystems.

<sup>75</sup> National Waste Management Strategy and Master Plan for Myanmar (2018-2030).

<sup>76</sup> ECD, MONREC (2018): Myanmar National Hazardous Waste Management in Master Plan. Draft for Consultation Purposes. 28 September 2018.

- deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination);
- (3) Goal 6 of SDGs: Ensure availability and sustainable management of water and sanitation for all (specifically Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally);
  - (4) Goal 8 of SDGs: Promote sustainable economic growth, full and productive employment and decent work for all (Specifically Target 8.8 Protect labour rights and promote safe and secure working environments for all workers);
  - (5) Goal 11 of SDGs: Make cities and human settlements safe, resilient and sustainable;
  - (6) Goal 12 of SDGs: Ensure sustainable consumption and production patterns (specifically Target 12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment);
  - (7) Goal 14 of SDGs: on life below water contributing to reduction of marine litter and related POPs contamination of the marine environment;<sup>77</sup>
  - (8) Goal 15 of SDGs: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss (specifically Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements; and Target 15.3: By 2030, combat desertification, restore degraded land and soil).

The NIP can also contribute to the Myanmar Climate Change Strategy (2018-2030) and Myanmar Climate Change Master Plan (2018-2030)<sup>78</sup> and in particular to resilience from pollution related to flooding. During flooding events, POPs and other persistent chemicals play a particular role when they are distributed from storages at industrial sites or from stockpiles or from landfills/dumpsites into the environment.<sup>79,80</sup> This lead to the contamination of soils and sediments with POPs and other persistent chemicals with

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<sup>77</sup>Gallo F, Fossi C; Weber R; Santillo D; Sousa J; Nadal A, Romano D (2018) Marine litter plastics and microplastics and their toxic chemicals components: the need for urgent preventive measures. Environmental Sciences Europe DOI:10.1186/s12302-018-0139-z

<sup>78</sup> MoNREC (2019) Myanmar Climate Change Strategy (2018-2030) and Myanmar Climate Change Master Plan (2018-2030)

<sup>79</sup> Weber R, Tysklind M, Laner D, Watson A, Forter M, Vijgen J (2012) The need for inventories of reservoirs of persistent and toxic substances (PTS) in the face of climate change. Organohalogen Compounds 74, 1186-1189 <http://www.dioxin20xx.org/wp-content/uploads/pdfs/2012/1304.pdf>

<sup>80</sup> Weber R, Watson A, Forter M, Oliaei F (2011) Persistent Organic Pollutants and Landfills - A Review of Past Experiences and Future Challenges. Waste Management & Research 29 (1) 107-121.

associated risk for food producing animals raised on such soils.<sup>81</sup> Such flooding also mobilizes waste from dump sites to the wider environment including plastic with associated pollution including marine litter.

At the governmental level, all relevant ministries will be involved in the NIP implementation in which each ministry will have different responsibilities with respect to its function. As interministerial coordination, the NIP will cooperate with the related committees of the National Environmental Conservation and Climate Change Central Committee (NECCCCC) and the supervision committees in the states/regions.

This inter-ministerial coordinating mechanism is considered vital in addressing chemicals and waste management issues (including POPs). This inter-ministerial coordination group would address relevant chemical, waste and circular economy/3R and related SDG topics. To address the national priority of chemicals and waste, a coordinated approach will be adopted, with co-operation among all relevant stakeholders at all levels and sectors. Responsibilities related to the sound management of chemicals and waste as well as those involved in activities that influence chemical safety, including the private sector, industry, labour, science and public interest groups will be assigned.

For this also the science–policy interfaces would be better developed. A well-established science-policy interface is critical in shaping environmental governance and sustainable development. Currently science and other forms of knowledge are often not used effectively in policymaking; and policymakers do not always effectively inform scientists about their needs for scientific knowledge. For this strategy element, an improvement of science-policy interface is needed as well as an upgrade of research institutions in respect to chemicals and waste management and is included in the action plan.

### **3.2.2 Adequate legal, institutional, administrative and technical infrastructure**

For the implementation an adequate legal, institutional, administrative and technical infrastructure needs to be in place. This should consider three levels:

- (1) **Policy level:** preparative and executive legislative actions, international co-operation on policy issues;
- (2) **Management level:** support legislative work, daily scientific/technical implementation work, and coordination/co-operation between ministries;
- (3) **Enforcement level:** enforcement and monitoring, co-operation/co-ordination between institutions for enforcement and supervision.

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<sup>81</sup> Weber R, Herold C, Hollert H, Kamphues J, Blepp M, Ballschmiter K (2018) Reviewing the relevance of dioxin and PCB sources for food from animal origin and the need for their inventory, control and management. *Environ Sci Eur.* 30:42. <https://rdcu.be/bax79>

The legal frame is needed to consider possible approaches which can support financing of chemicals and waste sector. An international guidance has been developed to support financing of chemical management this respect.<sup>82</sup> Furthermore, Extended Producer Responsibility (EPR)<sup>83</sup> and Polluter Pays Principle (PPP) are also one of the possible approaches to support sustainable financing of chemical and waste management sector.

Furthermore, an adequate technical infrastructure is needed for the management of POPs impacted wastes or the analysis and monitoring of relevant POPs. Appropriate actions are proposed in the action plans below.

### **3.2.3 Synergies among related Multilateral Environmental Agreements (MEAs)**

At the international level, the COPs to the chemical conventions called for greater cooperation and coordination, and measures to be taken for a more harmonized implementation. Myanmar has ratified and is a signatory to the Basel Convention and other international conventions and agreements and is also aware that efforts should be made for a harmonized implementation at the national level.

Moreover, the Strategic Approach to International Chemicals Management (SAICM) aims at an overall management of chemicals and has POPs related emerging policy issues and issues of concern.<sup>84</sup> Here the implementation of the SC could facilitate the implementation of SAICM and vice versa. The government seeks to follow the SAICM beyond 2020 process and to strive for an overall chemical and waste management considering all hazardous substances and waste including POPs.

Hazardous waste management is an important requirement for the adequate implementation of SC and BC. However, Myanmar has limited waste destruction capacity, and therefore, most of the chemicals, products and imported materials at the end of their useful life are disposing at dumpsites. Only a minor fraction of the materials is recycled. The leaching of POPs and other chemicals from landfills and dumps normally go into ground- and surface water and cause related impact to the environment and biota so, it is necessary for an improvement of the situation and an integrated management approach of the import, consumption and treatment of POPs chemicals and POPs similar chemicals in products.

Due to the challenge of POPs management and the high cost of export, the government became aware that hazardous chemicals, which cannot be disposed in the country, are a burden which needs to be tackled and solved. The expensive and time-

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<sup>82</sup> UNEP (2015) Development of Legal and Institutional Infrastructures for Sound Management of Chemicals and Measures for Recovering Costs of National Administration (LIRA-Guidance).

<sup>83</sup> OECD (2016) Extended Producer Responsibility - Updated Guidance for Efficient Waste Management

<sup>84</sup><http://www.saicm.org/Implementation/EmergingPolicyIssues>

consuming waste management and export efforts for PCBs, POPs pesticides, but also Ozone Depleting Substances (ODS), have alarmed the government and the private sector to seek a more sustainable management of chemicals and products containing hazardous chemicals.

Furthermore, international efforts in protecting the Ozone Layer (Montreal Protocol/Vienna Convention) on ODS address partly the same waste categories containing POPs: air conditioners in cars or HBCD containing extruded polystyrene (XPS) normally containing 8% hydrofluorocarbon (HFC) as blowing agent (often HFC-134a with high global warming potential (GWP) value of 1300). The inventory of vehicles, electronic waste and building insulation in the framework of the SC for POPs-PBDEs and the improvement of their end-of-life management can at the same time be used for a better management of ODS present in these products and wastes.

Overall, it became obvious that another policy for imports of chemicals and products containing hazardous chemicals is needed. This becomes also obvious considering consumer products and related waste fractions containing to some extent new industrial POPs like plastic from electrical and electronic waste (WEEE; e-waste), car shredder residues, waste wood treated with PCP or waste oils or impregnated furniture, mattresses, synthetic carpets, textiles or paper. Such bulk wastes containing POPs, POPs-like chemicals or other hazardous chemicals have entered the country in thousands of tonnes over the last three decades and are currently largely disposed in dumpsites. This highlights that another waste management, extended producer/importer responsibility and import policy is needed to cope with the materials and articles containing hazardous chemicals of modern consumer society.

### **3.2.4 Addressing POPs substitution and clean material cycles within sustainable consumption and production (SDG12) implementation**

In accordance with the provisions of the Article 7(3) of SC, “Parties shall endeavour to utilize and, where necessary, establish the means to integrate national implementation plans for persistent organic pollutants in their sustainable development strategies where appropriate”, the country is aiming to address POPs in connection to sustainable development, consumption and production efforts (SDG 12). Chemicals and waste including POPs were highlighted in the former National Sustainable Development Strategy for Myanmar in 2009<sup>85</sup> and will be mainstreamed into the new MSDP which has not yet any detailed strategies for resource recovery from wastes or a strategy towards a (more) circular economy. Here the NIP can complement the MSDP by contributing to facilitate a more circular economy by phase out of POPs.

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<sup>85</sup> Ministry of Forestry (2009) National Sustainable Development Strategy for Myanmar. August 2009

The contamination of several potential recycling flows by POPs revealed the negative impact and threat for a more circular economy, resource recovery and conservation important for sustainable development<sup>86</sup>. This includes e.g. treated wood or polymer fractions such as WEEE plastic or Polyvinyl chloride (PVC) and BFR containing polymer fraction of end-of-life vehicles and construction & demolition wastes. Also rubber and lubricants/industrial oils can be impacted by new industrial POPs. These wastes are at the same time important resources for recycling and recovery. The policy is to recycle the non-impacted products and treat POPs containing wastes in an environmentally sound manner possibly with energy recovery. For thermal recovery the negative impact of halogens need to be considered.

A policy approach considered is extended producer and importer responsibility as stipulated e.g. by the European WEEE Directive<sup>87</sup>. Improved recycling and recovery are also opportunities for development of small and medium sized companies and therefore of eradication of poverty and improvement of standard of living for people. The recycling efforts are linked to sustainable production and consumption. Considering the challenges of managing POPs, a policy and strategy will be developed within the implementation of SC and BC that POPs and similar chemicals should not be imported.

Several POPs have exemptions for continued use often in products (For example, HBCD, DecaBDE, SCCP, PFOS, PFOA). The use of these POPs would generate more POPs stockpiles and waste in the future. Furthermore, there are hundreds of POPs-like chemicals<sup>88</sup> and chemicals of concern<sup>89</sup> (SAICM synergy) which need to be controlled to protect human health and the environment. The implementation strategy is not to use POPs or POPs-like chemicals but to use the most appropriate alternatives considering green and sustainable chemistry principles. The alternative chemicals are best selected considering a “green and sustainable chemistry “approach, which represents the design of chemicals and processes that reduce or eliminate the use and generation of hazardous substances. This approach is securing recycling and reuse and therefore supporting circular economy and sustainable production and consumption.

Such efforts can also be linked to sustainable consumption of the population and POPs can be used here as an awareness raising tool for stakeholder groups.

### **3.2.5 Gender policy in NIP development and implementation**

Efforts to ensure sound management of chemicals including POPs have important gender dimensions, because in daily life, men, women, and children are exposed to

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<sup>86</sup> European Commission; Circular Economy [http://ec.europa.eu/environment/circular-economy/index\\_en.htm](http://ec.europa.eu/environment/circular-economy/index_en.htm)

<sup>87</sup> [http://ec.europa.eu/environment/waste/weee/index\\_en.htm](http://ec.europa.eu/environment/waste/weee/index_en.htm)

<sup>88</sup> Scheringer et al. (2012) How many Persistent Organic Pollutants should we expect? Atmospheric Pollution Research 3, 383–391.

<sup>89</sup> Muir DC, Howard PH (2006) Are there other persistent organic pollutants? A challenge for environmental chemists. Environ Sci Technol. 40(23):7157-7166.

different kinds of chemicals in various concentrations<sup>90</sup>. Biological factors, notably size and physiological differences between women and men and between adults and children, influence susceptibility to health damage from exposure to toxic chemicals. Also social factors, primarily gender-determined occupational roles, also have an impact on the level and frequency of exposure to toxic chemicals, the kinds of chemicals encountered, and the resulting impacts on human health<sup>91</sup>. For the NIP implementation and in the sound chemical management care will be taken that these gender dimensions are reflected.

Consistent with the GEF policy on gender mainstreaming, GEF projects funded under this strategy will not only acknowledge gender differences within their design but determine what actions are required to promote both women and men's roles in chemical management, disproportionate chemical exposure and vulnerability, as well as sustainable alternatives.

### **3.3 Action plans, including respective activities and strategies**

#### **3.3.1 Institutional and regulatory strengthening measures**

The issue of hazardous chemicals and wastes (including POPs) is of great concern and a priority. At present, the Hazardous Waste Management Master Plan and Hazardous Waste Management Rule have been drafted and in the process to issue. The Stockholm Convention on POPs requires Parties to take certain measures to achieve the objective of the Convention. Furthermore, other ratified chemical conventions should be considered in particular Rotterdam and Basel Conventions. Moreover, the Strategic Approach on International Chemical Management (SAICM) aims at an overall management of chemicals because it has POPs related emerging policy issues and issues of concern. Here the implementation of the Stockholm Convention can facilitate the implementation of SAICM and vice versa.

A successful implementation of the Stockholm Convention would therefore attempt an integrated approach with Basel Convention, Rotterdam Convention, SAICM and integration of some related provisions into the current institutional and regulatory framework for managing chemicals in the country.

The most readily available tool for government to ensure adequate flow of information on hazards and safe use, handling and transport of chemicals on the market is the national adoption of the internationally agreed information system found in the GHS.<sup>92</sup> Introduction of this system on chemical labelling and safety data sheets will also be an

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<sup>90</sup> UNDP (2011) Gender & Chemicals. Energy & Environment Practice Gender Mainstreaming Guidance Series

<sup>91</sup> United Nation Development Programme, Gender Mainstreaming. A Key Driver of Development in Environment and Energy, Energy and Environment Practice. Gender Mainstreaming Guidance Series

<sup>92</sup> It need to be stressed that GHS does not adequately address chemicals in products and wastes which is a major issue and problem for POPs and other hazardous chemicals in products and related waste management.

important step that governments can take to raise enterprise, worker and public awareness of chemical risks.

The POPs action plan aims at improving the existing institutional and regulatory framework in the country and facilitates chemical and waste management. One objective is to support the development of an overall frame of chemical and waste management by a synergy approach with Basel Convention and SAICM implementation. This can be mainstreamed into the MSDP contributing in particular to Strategy 3.6 of MSDP: “Build a priority infrastructure base that facilitates sustainable growth and economic diversification”. and Strategy 4.3 of MSDP: “Expand an adaptive and systems based social safety net and extend social protection services throughout the life cycle”.

The current action plan aims to support the development of a larger institutional frame for chemical management (SAICM synergy, Myanmar National Waste Management Strategy and Master Plan (2018-2030) with Myanmar National Hazardous Waste Management Master Plan).

**Table 35. Action plan for institutional and regulatory strengthening measures**

Objectives	Activities	Outputs	Implementers
(1) To assess, harmonize and update existing legal/policy framework on POPs and other hazardous chemicals	(1.1) Compile existing legislations on life cycle management of POPs and other hazardous chemicals in selected other countries.	Compiled and updated inventory of legislation.	<b>Main Implementer</b> MONREC, MOPFI  <b>Supporting</b> MOALI, CDCs, MOCn, MOHS, UAGO, Parliament, MOCe. MOEE, MOTC, MOE, MOHA, Private sectors (UMFCCI etc.)
	(1.2) Review existing legislations on management of POPs and other hazardous chemicals in selected other countries.	Prepared Proposals for legislative and policy review.	
	(1.3) Draft regulations to prohibit/eliminate the production, use, import and export of listed POPs (considering exemptions).	Draft regulation for overall chemicals law	
	(1.4) Improve or develop an overall chemical regulatory frame including the assessment of chemicals in use and chemicals for registration (POPs and other hazardous properties).	-	
(2) Assessment of responsibilities of ministries and other authorities for the life cycle management of POPs (and other hazardous chemicals; SAICM synergy)	(2.1) Compile and assess responsibilities of institutions for life cycle management of POPs and other hazardous chemicals and related gaps and needs assessment.	Assessment conducted	
	(2.2) Addressing gaps and improving capacity for the life cycle management	Modalities for upgrading physical capacities in place	

Objectives	Activities	Outputs	Implementers
	of POPs and other hazardous chemicals.		
	(2.3) Developing materials for education and conduct trainings and workshops.	-	
	(2.4) Assessment of the responsible institutions to implement the respective legislation, to access further gap for improvement	-	
(3) To inform, sensitize and capacitate institutions and stakeholders on regulations and on enforcement and compliance of regulations on POPs and other hazardous chemicals (SAICM)	(3.1) Development of information materials on regulatory requirements for the respective POPs tailored for institutions, industries and other stakeholders.	Information materials on regulatory requirements are developed	
	(3.2) Organize information and sensitisation workshop on regulatory issues for stakeholder groups for individual POPs	Workshop held	
(4) To assist relevant institutions with compliance and enforcement for (i) POPs Pesticides; (ii) PCBs;	(4.1) Form a Compliance and Enforcement Network on managing POPs and hazardous chemicals in the life cycle.	Compliance and enforcement network operational.	
(iii) new industrial POPs; (iv) Dioxins/Furans etc. and other	(4.2) Build capacity of personnel from all relevant institutions. e.g. recruitment and training of staff.	Well-equipped institutions	

Objectives	Activities	Outputs	Implementers
hazardous chemicals (SAICM).	(4.3) Develop monitoring plan of activities for relevant institutions.	Operational monitoring plans	
(5) To develop regulatory frame for management of POPs-BFRs (hazardous chemicals) and related articles and waste categories	(5.1) Development of regulatory frame for EEE/WEEE management	Regulatory frames for EEE/WEEE developed	
	(5.2) Development of a regulatory frame for vehicles management (e.g. EU ELV directive).	Regulatory frames for vehicles developed	
	(5.3) Development of a regulatory frame for HBCD in insulation.	Regulatory frame for HBCD insulation foams developed	
(6) To establish policy and regulatory framework for management of PFOS and related substances and other PFAS (SAICM synergy)	(6.1) Development of regulatory frame for control and management of PFOS and PFAS	Law and policy in place	
	(6.2) Banning of PFOS possible exemptions	exemptions listed/registered	
	(6.3) Custom control and improvement of the traceability of PFOS and PFAS in imports (including chemicals in products. including GHS)	GHS and customs trained	
	(6.4) Extended producer/user responsibility for management of PFOS and PFAS for the life cycle (including disposal)	EPR in place	
(7) Development of an adequate legislative frame and policy for	(7.1) Update the existing regulations by banning and regulating to restrict/	Updated legislation, regulation and list of banned pesticides	

Objectives	Activities	Outputs	Implementers
management of pesticides	address all listed POPs pesticides		
	(7.2) Implementation of GHS and related labeling	GHS implemented	
	(7.3) Develop regulatory measures to combat illegal traffic of banned pesticides and counterfeit pesticides	Regulatory measures in place	
	(7.4) Develop regulatory frame for good agricultural practice, IPM and organic farming	Regulatory measures in place	
	(7.5) Regulatory frame for wood treatment and for management of Pentachlorophenol (PCP), hazardous chemical and treated waste wood	Legislation for wood treatment and management of wood established	
	(7.6) Develop regulatory frame for pesticide and toxic chemical containers	Regulatory frame for pesticide and toxic chemical containers in place	
(8) Development and implementations of legislative frame, policy and measures for control and management of PCBs and PCNs in closed and open applications (equipment, materials and wastes).	(8.1) Development of regulations for removing and eliminating PCBs/PCNs in use /out of use and strengthening the current legislative frame.	Regulations are developed and inspections are conducted on PCBs/PCNs in use and waste.	
	(8.2) Establishing penalties/ fines for the improper management of PCBs/PCNs containing equipment, as well as for late or no submission of progress reports to the responsible	Penalties/fines are established, regulated and implemented	

Objectives	Activities	Outputs	Implementers
	<p>authorities on amount of PCBs containing equipment that are in use, out of use and on the amount of equipment disposed.</p>		
	<p>(8.3) Defining a National PCBs/PCNs Elimination Plan, to be included into the Master Plan for Hazardous Waste Management (MPHWM) and, defining the liabilities for institutions and companies in respect to PCB/PCN containing wastes management and disposal</p>	<p>National elimination plan in place</p>	
	<p>(8.4) Strengthening the control/inspection of the locations where PCB/PCN containing equipment is still in use, as well as of the interim storages and disposal facilities are operated</p>	<p>Competent authorities have the capacity to control in-use PCB equipment and storage and disposal facilities</p>	
	<p>(8.5) Setting legislative requirements for interim storage, transport and disposal facilities of PCB/PCN containing wastes</p>	<p>Regulations enacted for storing, transport and disposal of PCB/PCN containing wastes</p>	
<p>(9) To establish policy and legal framework for reduction and minimization of unintentional POPs</p>	<p>(9.1) Undertake law and policy assessment on PCDD/F and other UPOPs and possible co-pollutants.</p>	<p>Assessment report compiled and presented to relevant stakeholders</p>	
	<p>(9.2) Amend existing laws, or develop</p>	<p>Legislation frame for UPOPs, waste</p>	

Objectives	Activities	Outputs	Implementers
	new laws where needed, related to the management of UPOPs possibly within an integrated pollution prevention and control approach.	hierarchy and circular economy and open burning are established and implemented	
	(9.3) Develop emission standards or limits for UPOPs for sources and in environmental media or food considered relevant.	Emission standards or limits for UPOPs are developed	
	(9.4) Conduct awareness and training for stakeholders on legal issues of UPOPs and integrated pollution prevention and control.	Awareness and education workshops and training for stakeholders conducted	
(10) Regulatory frame for contaminated sites	(10.1) Develop/update legislation to set criteria for determining contaminated sites for relevant POPs.	Draft regulation developed on contaminated sites and soils.	
	(10.2) Establish guidelines for soil and ground water assessment and legislation on liability Polluter Pays Principle (PPP) related to contamination and clean-up procedures.	Draft establish on guidelines for soil and ground water assessment, in addition legislation on liability of Polluter Pays Principle (PPP) related to contamination and clean-up	
Please note: Time frame for action plan institutional and regulatory strengthening measures is shown in Table 51.			

### **3.3.2 Production, import and export, use, stockpiles, and waste of Annex A POPs pesticides of SC Text (Annex A, Part I Chemicals of SC Text)**

Most of the POPs pesticides listed in the Convention have been banned in Myanmar.

Most of the POPs pesticides have been substituted in the past 20 years by other pesticides all over the world and highly hazardous pesticides (HHPs) have been introduced and which can impact on pollinators and ecosystem.<sup>93,94</sup> Also in Myanmar imidacloprid and other neonicotinoids were a main substitute of POPs pesticides. Imidacloprid clothianidin and thiamethoxam have been banned in Europe due to the impact on biodiversity in particular pollinators. Such considerations are relevant for Strategy 5.1 of MSDP: “Ensure a clean environment together with healthy ecosystems” and Strategy 4.4 of MSDP: “Increase secure access to food that is safe and well-balanced”.

For successful implementation of the strategy, the gaps in the current system should be addressed in particular the selection of alternative pesticides. Another gap is that information about the risks of pesticides to the environment and ecosystem including pollinators and human health should be analysed to ensure the safety of farmers, consumers, and pesticide dealers.

Furthermore, clear guidelines should be developed for the storage, disposal, and transportation of pesticides.

The overall objective of the NIP Strategy and Action Plan is to use less pesticide and to ensure a safe use of pesticides for environmental and human health. The strategy that is currently being executed is based on:

- (1) Banning the use of POPs and highly hazardous pesticides;
- (2) Development of Integrated Pest Management (IPM), organic farming and Integrated Vector Management (IVM);
- (3) Use of environmentally safe pesticides and safe use of potential hazardous pesticides;
- (4) Environmentally safe disposal of pesticide contaminated waste including pesticide containers.

Please note: The regulatory and policy actions for pesticides is integrated in institutional and regulatory strengthening measures in Chapter III.

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<sup>93</sup> Rahman MM, Weber R, Tennekkes H, Sanchez-Bayo F (2012) Substitutes of persistent organic pollutant (POP) pesticides in Bangladesh and the need for a sustainable substitution process. *Organohalogen Compounds* 74, 1178-1181 <http://www.dioxin20xx.org/wp-content/uploads/pdfs/2012/1302.pdf>

<sup>94</sup> Chagnon M, Kreutzweiser D, Mitchell EA, Morrissey CA, Noome DA, Van der Sluijs JP. *Environ Sci Pollut Res Int.* 2015 Jan;22(1):119-34. doi: 10.1007/s11356-014-3277-x. Epub 2014 Jul 19. Risks of large-scale use of systemic insecticides to ecosystem functioning and services.

**Table 36. Action plan for importing and exporting, usage, stockpiles, and wastes of POPs pesticides (Annex A of SC Text) and highly hazardous pesticides (HHPs; SAICM synergy)**

Objective	Activities	Outputs	Implementers
(1) Develop/update POPs pesticides inventory	(1.1) Improvement of POPs Pesticide inventory possibly considering the FAO Pesticide Stock Management System (PSMS) and overall pesticide stockpiles; avoiding reoccurrence of obsolete pesticides)	Updated inventory	<b>Main Implementer</b> MONREC, MOALI  <b>Supporting</b> MOPFI, CDCs, MOHS, MOCe, MOE, MOHA, MOTC, Private sectors (UMFCCI etc.)
	(1.2) Inventory of former Pentachlorophenol (PCP) use and PCP treated materials such as leather, textile, paper, agriculture, wood and PCP wood treatment sites (link to Dioxin/UPOPs)	Validated Inventory	
(2) Life cycle management of POPs Pesticides including handling, storage, transfer and disposal of POPs pesticides and POPs pesticides wastes	(2.1) General improvement of POPs pesticides and general pesticide life cycle management	Life cycle management of pesticides established considering FAO guidance documents	
	(2.2) Establishing of an empty pesticide containers collecting and management system	Report on empty pesticide container program	
	(2.3) Establishing of proper POPs and pesticide waste storages and securing them	Sufficient pesticide storage built	
	(2.4) Establishing capacity to address emergencies and disasters relative to	Poisoning centre established and operative	

Objective	Activities	Outputs	Implementers
	POPs pesticides and HHPs (poisoning, spillage, fires contamination)		
	(2.5) Assessing the country's capacity for disposing of obsolete POPs pesticides stockpiles and/or considering the export for environmentally sound disposal	Capacity assessed and options of disposal documented (report)	
	(2.6) Disposal of POPs pesticides	POPs pesticides are disposed in an environmentally sound manner	
(3) Education and awareness of stakeholders (customs, farmers, NGOs and the public)	(3.1) Strengthen the inspection on pesticides for customs and for competent authority (market survey, sales, storage, usage and disposal including counterfeit and illegal pesticides).	Number of educated customs and competent authority	
	(3.2) Awareness raising of policy makers on health hazards of POPs pesticides and HHPs and the benefits of IPM and organic farming.	Policy makers in relevant ministries understood relevance	
	(3.3) Education of farmers on POPs pesticides, HHPs, counterfeit pesticides and the use of IPM and organic farming.	Number and share of educated farmers	
	(3.4) Education of citizens and NGOs on POPs pesticides, HHPs, counterfeit	Number of educated citizens and NGOs	

Objective	Activities	Outputs	Implementers
	pesticides and organic farming and organic products		
(4) Assessment of POPs pesticides and HHPs and alternatives used and implementation of substitution and IPM and organic farming. (SAICM Synergy)	(4.1) Compilation of information on alternatives to POPs pesticides and HHPs (SAICM Synergy) including a risk assessment for POPs pesticides and HHPs and their alternatives using existing and possibly generating new data, including the risk to humans and biota and ecosystem indicators	Report on assessment on alternatives to POPs and HHPs.	
	(4.2) Supporting implementation and research on IPM/IVM, including the use of alternatives as a measure for reducing POPs pesticides and HHP use	Shift to IPM/IVM (report)	
	(4.3) Selection of the most sustainable alternative chemicals and non-chemical solutions in the different applications and including promotion of organic farming.	Report on alternatives and Target for organic farming	
	(4.4) Education and capacity building on alternatives and organic farming and implementation	Number of farmers educated and share of alternatives and organic farming	
(5) Established analysis and monitoring of POPs pesticides and HHPs (SAICM synergy) (products,	(5.1) Strengthening and developing laboratory capacity to analyse pesticides (including POPs and Highly	Laboratory capacity established and accredited	

Objective	Activities	Outputs	Implementers
environment, food, exposure)	Hazardous Pesticides)		
	(5.2) Assessment of occupational exposure to POPs pesticides and HHPs	Report on occupational risk	
	(5.3) Monitoring and establishing a pesticide monitoring programme (food, soils, water, consumer)	Report on POPs pesticide and HHP pollution situation and risk for human, environment and ecosystem indicators	
(6) Established capacity of risk and socio-economic assessment	(6.1) Development of knowledge, capacity, tools and indicators to better assess the risks and socio-economic impact of POPs/HHPs	Experts or institution with capacity in risk and socio-economic assessment	
Please note: Time frame for Action plan import and export, use, stockpiles, and wastes of POPs pesticides (Annex A of SC Text) and highly hazardous pesticides (HHPs; SAICM synergy) is shown in Table 51.			

### **3.3.3 Import and export, use, identification, labelling, storage, and disposal of PCBs and equipment containing PCBs (Annex A, Part II Chemicals of SC Text)**

The overall objective of the strategy and action plan is to have PCBs-free equipment and materials being used in the country. Acknowledging that currently PCBs are found in electrical devices and that alternatives to these devices should be used, the strategy and action plan for eliminating the use of PCB containing and contaminated equipment should focus on the proper management and phase-out of this equipment.

While the major focus of this action plan is on management of PCBs, also PCNs are addressed in this action plan. PCNs have been listed in the Convention in Annex A and C of SC Text in 2015. PCNs have been used in the same application as PCBs but mainly in the 1930s to 1960s in closed application mainly in capacitors and less in transformers and hydraulic oils (UNEP 2017)<sup>95</sup>. PCNs have also been used in the same open applications as PCBs (additives in paints, sealants, rubber, cable sheaths and as metal working fluids). The total production was approx. 150,000 tonnes (10% of global PCB production). Due to the lower use volume and the earlier production/use, industrial PCNs have much lower overall relevance compared to PCBs and it is unknown if any relevant amount of PCNs are present in the former uses. PCNs can be managed within the frame of PCB management. They are detected by the chlorine test kits for screening of PCBs in transformers and would be integrated in the instrumental screening for chlorine positive samples.

Furthermore Short-Chain Chlorinated Paraffins (SCCPs) have been listed at COP8 (05/2017) as POPs with a range of exemptions. SCCPs have substituted PCBs and PCNs in a wide range of open applications (e.g. paints, coatings, sealants, plastic additive/flame retardant, rubber, lubricants, metal working fluids). Since SCCPs will need to be addressed in the next NIP update and since the use is in these applications, an inventory of open applications would address all three POPs.

To adequately implement such a strategy and action plan it is necessary that a comprehensive inventory takes place together with risk assessments on both electrical devices and other sources of PCBs, PCNs and SCCPs such as ‘open applications’.

SC requires Parties to phase out the use of PCBs in equipment by 2025 and ensure elimination of PCBs by 2028. The proposed activities define specific actions in respect of managing PCBs/PCNs, both in the short and the long term in a manner that is consistent with the obligations of the Stockholm Convention. The overall objective is a reduction and ultimate elimination of PCBs use, the prevention of releases of the chemical into the

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<sup>95</sup> UNEP (2017) Draft guidance on preparing inventories of polychlorinated naphthalenes. UNEP/POPS/COP.8/INF/19.

environment, and to provide for environmentally sound disposal or final elimination of PCBs waste.

The strategy and action plan focus on provisions and measures in following areas: legislation, institutional setting, technical capacity, life cycle management, alternatives use as well as awareness raising.

**Table 37. Action plan for importing and exporting, usage, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II Chemicals of SC Text)**

Objective	Activities	Output	Implementer
(1) Development/ update of a PCB/PCN inventory in closed and PCB/PCN and SCCP inventory in open applications where relevant	(1.1) Updating the inventory of PCB/PCN containing closed equipment (in use and out of use) and development of an inventory of PCB/PCN in hydraulic oils (e.g. mining sector)	PCB/PCN inventory updated	<b>Main Implementer</b> MONREC, MOPFI, MOEE  <b>Supporting</b> CDCs, MOHS, MOCe, MOTC, MOE, MOHA, Private sectors, Companies and recyclers
	(1.2) Assessment of the past use of PCBs/PCNs and current/past use of SCCPs in open applications (e.g. sealants, paints, rubber, chloroprene, plastic additive, flame retardant, industrial oils) in the country	-	
	(1.3) Developing inventory of PCBs/PCNs and SCCPs in open applications	-	
	(1.4) Assessment of waste oil management and use & assessment and inventory of potentially PCB/PCN and SCCP contaminated waste oils.	-	
	(1.5) Assessment of risk posed by (waste) oils for food and feed, and assessment of human exposure bio monitoring).	-	
	(1.6) Developing and regularly	-	

Objective	Activities	Output	Implementer
	updating a database for PCB/PCN containing equipment (in use and storage) and open applications (e.g. buildings/constructions)		
(2) Life cycle management (handling, storage, transport and disposal) of PCBs/PCNs, PCB/PCN-containing equipment in open and closed application, PCB/PCN contaminated wastes	(2.1) Assessing the current situation and improvement needs of interim storage and disposal facilities for PCB/PCN containing equipment and wastes	Life cycle management of PCBs/PCNs conducted	
	(2.2) Implementing the convention guidelines for environment sound management of PCBs/PCNs equipment and wastes	-	
	(2.3) Establishing inspection/control on the handling, storage, transfer and disposal of PCB/PCN containing equipment and PCB/PCN containing/contaminated wastes	-	
	(2.4) Monitoring the progress on the PCB/PCN phase-out in closed and open applications	-	
	(2.5) Establishing capacity and preparedness to address emergencies and disasters related to PCBs/PCNs (transformer/storage, fires, poisoning, spillage, food contamination)	-	

Objective	Activities	Output	Implementer
	(2.6) Environmentally sound management and disposal of PCB/PCN containing equipment and waste	-	
	(2.7) Proper training for stakeholders on life cycle management (see awareness & education action plan)	-	
(3) Education and awareness of stakeholders (policy makers; customs, related industries, NGOs and the public) on PCBs/PCNs in closed and open applications (integrated in the awareness of chemicals in products (SAICM synergy))	(3.1) Raise awareness to policy makers on health hazards of PCBs and PCNs and the related risk for humans, environment and food security	Competent authority and relevant persons are educated on PCBs and PCNs related risk	
	(3.2) Strengthen the inspection capacity on PCBs and PCNs for customs	-	
	(3.3) Strengthen the inspection capacity on PCBs and PCNs for other competent authority (market survey, sales, storage, usage and disposal).	-	
	(3.4) Educate the utility sector, maintenance workers, citizens, NGOs and industry on PCB/PCN in transformers, capacitors and other closed equipment and on open applications of PCBs, PCNs and alternatives.	-	
(4) Assessment and promotion of	(4.1) Compilation of information on	Most sustainable alternatives for	

Objective	Activities	Output	Implementer
sustainable alternatives used for PCBs and PCNs in closed and open applications	alternatives in closed and open applications of PCBs/PCNs and SCCPs & assessment of alternatives used	PCBs/PCNs used	
	(4.2) Education on alternatives of PCBs/PCNs and SCCPs in closed and open applications	-	
	(4.3) Promotion of most sustainable alternatives in closed applications considering chemical aspects but also energy aspects	-	
	(4.4) Promotion of the most sustainable alternatives in (former) open applications of PCBs/PCNs and SCCPs	-	
(5) Established monitoring and analysis of PCBs and PCNs (closed and open applications, environment, food, exposure)	(5.1) Monitoring and analysis of PCBs/ PCNs in closed and open applications and others (environment, food, exposure)	Monitoring and analysis of PCBs/ PCNs in closed and open applications and others (environment, food, exposure) conducted	
	(5.2) Monitoring of PCBs/PCNs by development of own capacity (regional) or international collaboration	-	
	(5.3) Monitoring of occupational exposure (maintenance and	Monitoring of occupational exposure (Medical check-up and	

Objective	Activities	Output	Implementer
	remediation staff)	Proper Treatment carried out)	
	(5.4) Developing an integrated environment and health monitoring for assessing the PCB/PCNs (human, environment and biota, imports, food, contaminated sites)	Integrated environment and health monitoring conducted	
	(5.5) Improvement of inventory by monitoring approach where knowledge gaps have been identified.	Knowledge gaps identified and inventory updated	
(6) Identification, assessment, securing and possibly remediation of PCB/PCN contaminated sites	(6.1) Identification and assessment of PCB/PCN contaminated sites along life cycle (locations where PCB/PCN transformers and capacitors are/have been operating, use of lubricants/industrial oils, former maintenance areas and at PCB/PCN storage sites, scrap yards, waste oil recycling etc.)	PCB/PCN contaminated sites assessed and identified	
	(6.2) Identify the level of contamination of soil and ground water and potential receptors and exposure	Level of contamination identified	
	(6.3) Identification of PCB/PCN in open application, related contaminated buildings /construction and inappropriate removal and related contaminated sites and exposure	PCB/PCN in, related applications / contaminated sites identified	

Objective	Activities	Output	Implementer
	(6.4) Database and conceptual site models of potentially contaminated sites	Database and conceptual site models are in place	
	(6.5) Prioritization of the sites (risks) for further assessment and securing.	High risk contaminated sites are prioritized	
	(6.6) Secure and possibly remediate PCB/PCN contaminated sites	PCB/PCN contaminated sites are secured and possibly remediated	
<p>Please note: The action plan for PCBs/PCNs on regulatory frame is integrated in the general action plan in Institutional and regulatory strengthening measures in Table 35 and time frame for Action Plan import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs is shown in Table 51.</p>			

### **3.3.4 Import and export, use, stockpiles, and wastes of POP- PBDEs (Annex A, Part IV & V chemicals of SC Text), HBCD and HBB (Annex A, Part I Chemical of SC Text)**

According to the POP-PBDE inventory, POP-PBDEs listed in 2009 have been imported in electrical and electronic equipment, in vehicles and possibly in other goods. Therefore, they are present in stocks at consumer levels or as wastes. The amount of POP-PBDE is considerably higher than the current POP-PBDE inventory since DecaBDE has been listed as POPs in 2017 and is present in these articles and wastes in considerably higher concentration.

The action plan focuses on setting actions and measures whose implementation will lead to managing and controlling POP-PBDE containing products. For managing PBDEs, the life cycle management (import, export, use, recycling, destruction) of POPs containing articles/products and waste needs to be developed, in particular for EEE/WEEE, vehicles and end of life vehicles. In addition, HBCD and PBDEs are used in insulation of housings (polyurethane and polystyrene).

At the same time pollutants such as PBDE, HBCD and other POPs and persistent toxic substances (PTS) need to be phased out of the recycling.<sup>96</sup> Material and substance flow analysis (MFA/SFA) is a holistic inventory approach which can support policy making.

PBDEs might also be partly included in imported polyurethane or textiles which needs also further assessment.

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<sup>96</sup> Stockholm Convention (2017) Guidance on best available techniques and best environmental practices for the recycling and disposal of articles containing polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants; Draft 2017

**Table 38. Action plan for importing and exporting, usage, stockpiles and waste of POP-PBDEs (Annex A, Part IV & V Chemicals of SC Text), HBCD and HBB (Annex A, Part I chemical of SC Text)**

Objectives	Activities	Outputs	Implementers
(1) Update and refine inventory of PBDEs (including DecaBDE, HBCD) containing articles/ wastes/ resources and develop/ update appropriate databases for information management	(1.1) Update PBDE inventories considering DecaBDE (and other update if necessary)	Updated inventory report	<b>Main Implementer</b> MONREC, MOPFI, MOCT, MOCe, MOCn  <b>Supporting</b> CDCs, MOHS, MOPF, MOE, MOHA, Private industries and Companies
(2) Sound Life Cycle Management of PBDE and HBCD containing product and waste categories (EEE/WEEE, end of life vehicle, insulation foam)	(2.1) Develop dynamic MFA/SFA inventory for POPs/PTS in EEE/WEEE, vehicles and insulation foam (EPS/XPS and others) in construction.	Dynamic MFA/SFA POPs/PTS in EEE/WEEE, vehicles and construction developed	
	(2.2) Develop data management system for product and waste categories containing BFRs (for general waste management) and assessment of recycling/destruction options and limitations of product/waste categories containing POP-BFR.	Databank established and report on managing POP-BFR containing products and recycling/destruction options assessment report submitted	
	(2.3) Compile guidelines and guidance on safe handling of POP-BFR polymers in EEE, ELV, insulation foam from construction etc.	Guidelines selected or developed and translated	
	(2.4) Development of sound management of POP-BFR containing plastic and other polymer in	Management of POP-BFR containing plastic and other polymer in EEE/WEEE, end of life vehicles	

Objectives	Activities	Outputs	Implementers
	EEE/WEEE, end of life vehicles (ELV), buildings and construction, other uses found relevant in a larger frame of plastic management (link to marine litter etc.)	(ELV), buildings and construction is addressed, enforcement network is operational with appropriate capacity and operational monitoring plans are in place	
	(2.5) Identify destruction and energy recovery options for POP-BFR containing waste and develop phase out/destruction options for identified PBDEs sources.	Phase out/ destruction options identified and programs in place	
(3) To assess and select the most sustainable alternatives to POP-BFRs (HBCD and DecaBDE) in used/exempted applications.	(3.1) Compilation of information on alternatives to HBCD containing EPS/XPS insulation (see SC HBCD BAT/BEP guidance; POPRC) and DecaBDE (considering activities of POPRC; UNEP BAT/BEP group).	-	
	(3.2) Education and capacity building on alternatives assessment.	-	
	(3.3) Selection of the most sustainable alternative chemicals and non-chemical solutions in the different applications.	-	
	(3.4) Phase in of sustainable chemicals and non-chemical alternatives.	-	
(4) To apply BAT/BEP if HBCD (or	(4.1) BAT/BEP in production, use and	-	

Objectives	Activities	Outputs	Implementers
DecaBDE) in exempted uses to ensure the controlled use and ESM along the life cycle.	Environmental Sound Management of HBCD (EPS/XPS) in construction.		
	(4.2) BAT/BEP in recycling of POP-PBDEs containing plastic/polymers (please note that DecaBDE does not have a recycling exemption)	-	
	(4.3) BAT/BEP if DecaBDE in exempted uses and other exempted uses (plastic in EEE & vehicles, in textile (comment: unclear how to control life cycle)	-	
	(4.4) Labelling of products containing HBCD and DecaBDE	-	
(5) Awareness of major stakeholders on POP-BFR containing products and waste created (integrated in the overarching frame on awareness of “Chemicals in Products” and “Management of hazardous chemicals in the life cycle of EEE” SAICM synergy)	(5.1) Develop awareness creation strategy on impact (health, recycling, and environment) of POP-BFRs PBDEs, HBCD and other hazardous chemicals in the life cycle of EEE, vehicles, buildings, textiles and other impacted product categories.	-	
	(5.2) Developing awareness raising materials on POP-BFRs and other hazardous substances in EEE, ELVs, buildings etc.	Development of awareness raising materials	
	(5.3) Awareness raising campaigns for	-	

Objectives	Activities	Outputs	Implementers
	stakeholders (policy makers, authorities, industry, recyclers, research and public) on POP-BFRs within a larger awareness campaign on chemicals in products.		
	(5.4) Awareness of the public on POP-BFR impacted plastic within a general awareness on plastic and marine litter and sustainable consumption	-	
	(5.5) Conducting awareness creation campaigns to reduce/eliminate the practice of open burning of EEE/WEEE and ELV polymer scrap.	-	
(6) Build knowledge and capacity for management of POP-BFR impacted materials and waste categories within the life cycle management of hazardous substances in EEE, vehicles, buildings, furniture, textiles	(6.1) Carry out policy and regulatory needs assessment and develop recommendations	Policy and regulatory needs assessment report developed	
	(6.2) Capacity building of authorities and institution for developing the regulatory frame for life cycle management of EEE, ELVs, construction sector and others	Resource persons identified	
	(6.3) Develop training materials and programmes to monitor the enforcement of the regulatory frame for WEEE, ELV, insulation in buildings and other impacted waste	Training materials developed	

Objectives	Activities	Outputs	Implementers
	management and related polymer and POP-PBDEs management		
	(6.4) Capacity building for implementation of the regulatory frames for managing WEEE, ELVs and other impacted wastes	-	
	(6.5) Develop procedures on inspections and maintenance of stockpiles and waste of plastic and other polymers in EEE.	Procedures on inspections and maintenance of stockpiles and waste developed.	
	(6.6) Training/education of customs authorities on import control of WEEE, ELVs and other relevant products.	-	
	(6.7) Development of education and training materials for life cycle management of POP-BFRs (considering already available materials). Training of the staff in the recycling and waste management industry for relevant sectors within the life cycle management of hazardous substances in EEE, vehicles, buildings, furniture, textiles	-	
(7) Established monitoring of POP-BFRs and pollutants in the	(7.1) Assessment of options for monitoring of POP-BFRs	Assessment report and selected monitoring approach	

Objectives	Activities	Outputs	Implementers
technosphere and other priority areas	(international collaboration or development of regional capacity)		
	(7.2) Establish of monitoring approach for POP-BFRs (PBDEs, HBCD, PBB).	Monitoring approach selected and information compiled	
	(7.3) Monitoring of major product categories and related wastes/recycling	Monitoring results in priority areas generated and updated inventory	
	(7.4) Improvement of inventory by monitoring approach where knowledge gaps have been identified.	-	
	(7.5) Monitoring of humans, biota and environment for POP-BFR for effectiveness evaluation and in priority areas (e.g. contaminated site).	-	
Please note: The action plan for POP-BFRs on regulatory frame is integrated in the general action plan in Institutional and regulatory strengthening measures in Table 35 and time frame for Action plan elimination and management of POP-BFRs (PBDEs, HBCD and PBB) including timelines, responsible authorities and stakeholders is shown in Table 51.			
The action plan for POP-BFRs contaminated sites is integrated in the general action plan in Measures to reduce releases of unintentional POPs in Table 44.			

### **3.3.5 Import and export, use, stockpiles and wastes of DDT (Annex B Chemicals of SC Text) if used in the country**

DDT was used in Myanmar in the past for public health purposes. Earlier DDT uses were registered for exemptions by Myanmar, currently, it has been cancelled and DDT is prohibited and not registered for exemption. Since the use was prohibited, no export, registration, and control of DDT have been recorded. According to the information received from inventory team, there are some DDT stocks in the country.

**Table 39. Action plan for importing and exporting, usage,, stockpiles and wastes of DDT (Annex B Chemicals of SC Text)**

Objectives	Activities	Outputs	Implementers
(1) Further assessing and controlling illegal imports of pesticides including DDT	(1.1) Further assessment of illegal import activities including counterfeit pesticides	Report on the import situation of illegal pesticides	<b>Main Implementer</b> MONREC, MOALI, MOHS  <b>Supporting</b> CDCs, Private industries and Companies
	(1.2) Training of customs to control imports of illegal pesticides	Training on illegal pesticide import included in general training for customs	
(2) Manage the DDT stockpile	(2.1) Storage of stockpile in an ESM	Stockpile destroyed in an ESM	
Please note: Time frame for Action plan Import and export, use, stockpiles and wastes of DDT is shown in Table 51.			

### **3.3.6 Import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSF (Annex B, Part III Chemicals of SC Text)**

PFOS and related substances entered the country in consumer products and articles. The major stocks of PFOS in Myanmar are firefighting foams, which have been used in the past with generation of potentially contaminated sites and ground water. In Myanmar, synthetic carpets (tufted carpets) are used and most probably contained PFOS related substances in the past and currently other PFAS.

Currently, there is no monitoring capacity to assess potentially PFOS containing products or contaminated sites.

PFOS and related substances have been substituted mainly by other PFAS. PFAS are an issue of concern under SAICM. To promote the synergy of the Stockholm Convention and SAICM, the action plan is extended to other PFAS where appropriate.

Please note: The action plan for regulatory frame for PFOS is integrated in the general action plan in Institutional and regulatory strengthening measures in Chapter III.

**Table 40. Action plan for importing and exporting, usage, stockpiles, and wastes of PFOS, its salts and PFOSE (Annex B, Part III Chemicals of SC Text) (SAICM Synergy)**

Objectives	Activities	Outputs	Implementer
(1) Updated and refined inventory of PFOS and other PFAS (SAICM synergy) use and containing articles and wastes and developed/ updated databases for information management	(1.1) Refining inventory of PFOS and other PFAS in firefighting foams, consumer products and industrial use	Updated inventory with list of data gaps	<b>Main Implementer</b> MONREC, MOPFI, MOTC  <b>Supporting</b> MOALI, CDCs, MOCn, MOCe, MOHS, MOE, MOHA, Private companies
	(1.2) Refining of inventory of stocks and waste of PFOS and other PFAS (including landfills)	-	
	(1.3) Refining inventory of historic use and release of PFOS and PFAS (see contaminated site action plan)	-	
	(1.4) Material and substance flow analysis of PFOS/ PFAS	-	
(2) Life cycle management of PFOS/PFAS containing products, stockpiles and waste.	(2.1) Compilation of information and management situation of PFOS and PFAS containing products in the country	Report developed	
	(2.2) Assessment of management and destruction option of PFOS and PFAS containing stocks and wastes	Management and destruction options assessment report developed	
	(2.3) Policy and strategy for control and management of PFOS and PFAS containing products and wastes	Strategy incorporated in National Chemical and Waste Management Plan	
	(2.4) Environmentally safe storage of PFOS containing materials	PFOS containing waste stored safely	
	(2.5) Stop recycling of PFOS containing products	-	
	(2.6) Destruction PFOS containing waste and ESM of PFAS containing products	PFOS stocks and waste disposed; Compliance and enforcement of the	

Objectives	Activities	Outputs	Implementer
		SC	
(3) PFOS alternatives in used/exempted uses are assessed and PFOS is substituted by the most sustainable chemical and non-chemical solution	(3.1) Compilation of information on alternatives to PFOS and related substances (e.g. considering available information of POP Reviewing Committee)	Information materials developed and report disseminated.	
	(3.2) Education and capacity building on alternatives and alternatives assessment	Workshops held and training material developed	
	(3.3) Selection of the most sustainable alternative chemicals and non- chemical solutions in the different applications	Phase in and use of alternatives	
(4) Training and awareness raising for stakeholder groups on PFOS and other PFAS and establishing approach for information exchange	(4.1) Inform and sensitize stakeholders including users (e.g. fire fighters; paper/leather/furniture/aviation industry), policy makers and public on the environmental and health impact, environmentally sound management and alternatives of PFOS and related substances.	Number of sensitize workshops/seminar conducted , education materials developed and awareness created	
	(4.2) Training/education of customs authorities on PFOS (and other POPs and other hazardous substances) in articles and products.	Sufficient number of trained personnel	
	(4.3) Development of related education and awareness materials for individual stakeholders (considering already available materials)	Education/awareness material developed	
	(4.4) Dissemination of information on PFOS and PFAS	Stakeholders informed	
(5) BAT/BEP application in exempted uses	(5.1) Using BAT/BEP in case PFOS and related chemicals are used in industrial applications (including closed-loop systems)	BAT/BEP applied Minimum/zero emission achieved	

Objectives	Activities	Outputs	Implementer
	(5.2) For exempted use, if needed	Assessment report developed	
	(5.3) Labelling of products containing PFOS	Labelled products	
(6) Established monitoring of PFOS and other PFAS in priority areas	(6.1) Assessment of options for monitoring of PFOS and PFAS (international collaboration or development of own capacity)	Monitoring approach for PFOS and related substances has been established.	
	(6.2) Monitoring of major drinking water supplies	Monitoring of priority areas including major drinking water reservoirs conducted	
	(6.3) Improvement of inventory by monitoring approach where knowledge gaps exist.	-	
	(6.4) Monitoring of chemicals and chemicals in products known to contain PFOS and its related substances.	-	
	(6.5) Monitoring biota and soil samples for PFOS especially in vicinity of suspected contaminated sites.	-	

Please note: Time frame for Action plan for measures to reduce or eliminate PFOS and control PFAS is shown in Table 51.

### **3.3.7 Register for specific exemptions and the continuing need for exemptions (Article 4)**

Article 4 of the Stockholm Convention on POPs requires the establishment of POPs register for the purpose of identifying parties that have specific exemptions listed in Annex A or B of SC Text. All registrations of specific exemptions are subject to periodic review.

The listed POPs with specific exemptions and acceptable purposes have increased and meanwhile 9 POPs (HBCD, DecaBDE, SCCPs, PFOS, DDT, Lindane, PCP and recycling of PBDEs) have been listed with exemptions. If an exemption is needed, an informed decision needs to be made considering alternative chemicals and non-chemical solutions. Such an assessment need to be made by appropriate technical/research institutions and committees. After such a scientific assessment of an exemption is conducted, then the Secretariat of the Stockholm Convention/COP would be informed and than the exemption will be registered. Therefore, in this action plan, an activity is included to establish an appropriate systematic methodology, if an exemption is needed to appropriately meet the obligations under Article 4 in future.

**Table 41. Action plan for registration of specific exemptions and continuing need for exemptions (Article 4)**

Objectives	Activities	Outputs	Implementer
(1) To establish an informed registration process for needed exemptions	(1.1) Organize stakeholder consultation to establish criteria for assessment and selection of exemptions for chemicals listed under Annex A or B of SC Text	Stakeholder consultation held and outcomes documented	<b>Main Implementer</b> MONREC  <b>Supporting</b> MOALI, MOCn, MOCe, MOHS, MOEE, MOTC, MOE, MOHA, MOPFI. CDCs, Private Industries and Companies
	(1.2) Assess if exemptions are needed for HBCD, DecaBDE, or SCCPs and future listed PFOA	Country assessment of current listed POPs with exemptions (report)	
(2) If a certain POPs exemption is needed, to apply specific exemption	(2.1) Inform Secretariat of the Stockholm Convention/ COP on the exemption needed after thorough assessment of the need and the alternative options	Notification submitted and exemption listed	
	(2.2) Periodic review to assess the need for continued exemptions and alternatives and stop exemption and use more sustainable alternatives as soon as feasible	Review report	
Please note: Time frame for Action Plan Register for specific exemptions and continuing need for exemptions is shown in Table 51.			

### **3.3.8 Measures to reduce or eliminate releases from unintentional production (Article 5)**

Activities are proposed for the action plan to reduce the release from unintentionally produced POPs (PCDD/Fs, PCBs, PeCB and HCB). In the action plan the activities have been set by considering the listing of the priority sources in Annex C of SC Text, the total amount of contemporary releases as an outcome of the inventory process and considering point sources with potential risk to humans. The largest release of PCDD/Fs in Myanmar is open burning of waste (431.1 g TEQ/a; 50.5% of total) followed by hospital waste incineration (367.2 g TEQ/a; 9.1% of total), disposal (30.43 g TEQ/a; 3.56% of total) and ferrous and non-ferrous metal production (14.63 g TEQ/a; 1.7% of total).

#### **3.3.8.1 BAT/BEP (Best Available Technique and Best Environmental Practice)**

The technology level of the thermal sources is not according to BAT/BEP with possible exposure of operating staff and the surrounding. BAT/BEP in respect to PCDD/F control and reduction, is described in the “Guidelines on BAT and provisional guidance on BEP” developed within the SC <sup>97</sup>. Comprehensive BAT Reference documents (BREFs)<sup>98</sup> for incinerators and industries have been developed by the European Commission within the Integrated Pollution Prevention and Control process of the EU. These documents are publicly available and could be used in Environmental Impact Assessment (EIA) and permit procedures.

For healthcare waste incineration, BAT incinerators and BEP operation reduce releases. Also alternative non-incineration technologies are available. Furthermore, the substitution of Polyvinyl chloride (PVC) would reduce PCDD/F release from the small waste incinerators and considers the substitution principle of Article 5 of the Stockholm Convention. The reduction of Polyvinyl chloride (PVC) additionally brings the benefit of reduced phthalate and other softeners and exposure to patients.<sup>99</sup> Efforts can also be combined with reduction of mercury use in hospitals as synergy to the Minamata Convention.<sup>100</sup> Also emission from cement kilns or metal industries can be reduced by BAT/BEP.

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<sup>97</sup> Stockholm Convention (2009) “Guidelines on best available techniques and provisional guidance on best environmental practices” <http://chm.pops.int/Programmes/BAT/BEP/Guidelines/tabid/187/language/en-US/Default.aspx>

<sup>98</sup> BAT Reference (BREF) documents download page: <http://eippcb.jrc.es/reference/>

<sup>99</sup> [http://www.env-health.org/IMG/pdf/PVC\\_in\\_hospitals.pdf](http://www.env-health.org/IMG/pdf/PVC_in_hospitals.pdf);  
[http://www.accessmedicalsupply.com/content/preventing\\_harm\\_from\\_noharm.org/europe/issues/toxins/pvc\\_phthalates\\_avoiding\\_pvc\\_in\\_hospitals.pdf/alternatives.php](http://www.accessmedicalsupply.com/content/preventing_harm_from_noharm.org/europe/issues/toxins/pvc_phthalates_avoiding_pvc_in_hospitals.pdf/alternatives.php)

<sup>100</sup> <http://www.gefmedwaste.org/>

### 3.3.8.2 Waste management

Addressing open burning (9.1% of release) and improvement of waste management will also have relevant effect on the reduction of dioxin/UPOPs release but also other related releases like particulate matter (PM), PAHs and carbon black. Therefore, improved waste management is of crucial importance to avoid threats posed to the nation's air and soil integrity. Sustainable industrial development is only possible in the long run if there is proper developed waste management and related recycling and recovery schemes. The 3 R<sup>101</sup> approach (reduce, reuse, and recycle) and the circular economy emphasize that the principles of reduce, reuse, and recycle are the preferable options in the waste hierarchy; they should take precedence over other management options like incineration or landfill disposal where appropriate. A waste management system needs a comprehensive framework including;

- (1) Legal framework for waste management (Hazardous waste and non-hazardous waste);
- (2) Classification of waste, using a well-defined waste catalogue;
- (3) Database of waste generated in the country;
- (4) Collection, transport, and storage of waste;
- (5) Permission, monitoring, and controlling systems for wastes (in particular hazardous wastes);
- (6) Infrastructure of waste treatment including destruction capacity, or a detailed policy for the export of waste which should not be deposited;
- (7) Waste management plans;
- (8) Awareness-raising of all stakeholders.

### 3.3.8.3 Synergies in inventory making

Myanmar is establishing inventories for different pollutant releases (UPOPs, Greenhouse Gases, mercury). It should be assessed where efforts could be harmonized, and if they could be addressed within a common database or approach, such as e.g. Pollutant Release Transfer Register.<sup>102</sup>

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<sup>101</sup> UNEP Strategic Elements in implementing the 3R Platform [http://www.unep.or.jp/ietc/spc/3R\\_Strategic\\_Elements.pdf](http://www.unep.or.jp/ietc/spc/3R_Strategic_Elements.pdf)

<sup>102</sup> <https://www.unitar.org/cwm/portfolio-projects/pollutant-release-and-transfer-registers>.

**Table 42. Action plan for reduction and elimination of releases from unintentional production (Dioxins/UPOPs) (Article 5)**

Objectives	Activities	Outputs	Implementers
(1) Updated sources inventories for PCDD/Fs and possibly other listed UPOPs with data management and harmonization with related release inventories.	(1.1) Refine/update Dioxin/UPOP inventory	Inventory is updated	<b>Main Implementer</b> MONREC, MOPFI, CDCs,  <b>Supporting</b> MOALI, MOCn, MOCe, MOHS, MOEE, MOTC, MOE, MOHA, Private Industries and Companies
	(1.2) Development of a mechanism ensuring appropriate storage and management of data	-	
	(1.3) Quantify other co-pollutants (e.g. PAHs; carbon black)	-	
	(1.4) Development of an integrated database of pollutant releases (e.g. Dioxin/UPOPs, mercury, GHG; carbon black) Development of a PRTR.	-	
(2) Reduced releases from open burning of wastes (private burning & landfill fires) and biomass burning by improvement of waste management (waste hierarchy; circular economy).	(2.1) Regulatory frame for control of open burning	-	
	(2.2) Development of waste catalogue and related management options considering waste hierarchy	-	
	(2.3) Implementation of sound management of waste with increased reuse, recycling and recovery (3/Multi R concept towards a more circular economy).	-	
	(2.4) Energy recovery in cement plants and boilers/incinerators	-	
	(2.5) Construct engineered landfills	-	

Objectives	Activities	Outputs	Implementers
	for remaining waste disposal		
	(2.6) Develop guidance and awareness materials for detection, extinguishing and prevention of landfill/dumpsite fires.	-	
	(2.7) Closure of dump sites and stop illegal dumping of wastes (fines).	-	
	(2.8) Develop an awareness for landfill operators on the impacts of open waste burning and implement education program for control	-	
	(2.9) Awareness raising program and fines for open waste burning on private level	Open burning controlled and circular economy developed	
(3) To reduce and minimize release of UPOPs from waste incinerators	(3.1) Monitoring of hazardous and municipal waste incinerators for releases and improvement programs to meeting standards	release of UPOPs from waste incinerators controlled	
	(3.2) Education of operators and competent authorities on minimizing Dioxin/UPOPs release and emission control	BEP / BAT for incinerators developed	
	(3.3) Implementation of regulatory frame including BEP and/or BAT for meeting regulation limits (appropriate time frame).	-	

Objectives	Activities	Outputs	Implementers
	(3.4) Monitoring frame for incinerators	-	
	(3.5) Implementation of standardized incinerators with standard criteria in Township Hospital	-	
	(3.6) Assessment of technologies to treat healthcare waste	-	
	(3.7) Selection and implementation of sound treatment of healthcare waste including also non-incineration technologies	-	
	(3.8) Management of healthcare waste from health care facilities according to Healthcare Waste Management SOP and Guideline from MOHS.	-	
	(3.9) Strengthen institution and human resource capabilities to implement environmentally sound healthcare waste management	-	
(4) Adoption of BAT/BEP in ferrous and non-ferrous metal production and minerals production processes to reduce and minimize release of PCDD/Fs, UPOPs and other priority pollutants	(4.1) Assessment of the individual industries for BEP options for UPOPs reduction and if needed, options for BAT including Environmental Impact Assessment (EIA)	BEP / BAT for individual industries developed	
	(4.2) Assessing synergies for the reduction of unintentional POPs,	Synergies of pollutant reduction assessed and integrated approach	

Objectives	Activities	Outputs	Implementers
	mercury, PM, GHG and other relevant pollutants and where feasible address pollutants in an integrated manner.	developed	
	(4.3) Introduce and effectively implement BEP and where required BAT UPOP reduction measures (within integrated pollution prevention and control)	-	
	(4.4) Develop and promote institutions with technical assistance to support the implementation of cleaner production BEP and BAT	-	
(5) To conduct awareness raising and establishing network	(5.1) Develop education and awareness materials on the health and environmental impact of dioxins and other UPOPs	Awareness raising program for government, the public and other stakeholders and institutions	
	(5.2) Sensitize the public and stakeholders on the environmental and health impact of UPOPs	-	
	(5.3) Develop awareness creation strategy on impact of UPOPs and releases of other hazardous pollutants	-	
	(5.4) Awareness raising campaigns on dioxins/UPOPs and other pollutants of concern for relevant stakeholders and sources (open burning, industrial sources, industries, waste wood).	-	

Objectives	Activities	Outputs	Implementers
(6) Established monitoring of PCDD/Fs and other UPOPs and relevant pollutants from Annex II and III of SC Text sources and human exposure	(6.1) Assessment of the need and the options for monitoring dioxins and other UPOPs from priority sources and for human exposure (food, feed, soils).	Monitoring program conducted	
	(6.2) Establish and strengthen the national capacity for UPOPs monitoring considering instrumental analysis, bio-assay and international co-operations.	-	
	(6.3) Emission monitoring of Annex II and III of SC Text priority sources releasing PCDD/Fs and other UPOPs	-	
	(6.4) Monitor priority environmental and foods samples for dioxins and possibly other UPOPs (e.g. samples with potential human exposure for residents around suspected contaminated sites).	-	
	(6.5) Monitoring of chemicals and chemicals in products/articles known to potentially contain PCDD/Fs and other UPOPs.	-	

Please note: Time frame for Action plan for reduction and elimination of dioxins/UPOPs is shown in Table 51.

### **3.3.9 Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6)**

Toxic releases from stockpiles and waste constitute a serious threat to human health and the environment. It requires to be safe, efficient and environmentally sound management. Activities geared towards the development of appropriate strategies and measures to stem releases through actions such as proper handling, collection, transport and disposal of such stockpiles and waste are outlined below and in the action plans for the individual POPs.

In addition to remaining PCBs and pesticides, large volumes of POP-BFR containing wastes and stocks have been generated (WEEE plastic/ plastic/polymers of end of life vehicles, insulation foam from construction). A similar situation exists with PFOS and related substances (PFOS precursors) and related containing stockpile (carpets and possibly others). Currently perfluorooctanoic acid (PFOA) and perfluorohexanesulfonic acid (PFHxS) are evaluated by POPRC as POPs and SAICM has all perfluorinated alkylated substances as an issue of concern and related wastes (treated synthetic carpets, impregnated paper, textiles and furniture) will need to be managed and possibly destroyed in future.

Furthermore, SCCPs have been listed in 2017 which are still used in a wide range of applications (e.g. lubricants, metal working fluids, Polyvinyl chloride (PVC), rubber, textiles). By this current and past use, further POPs stockpiles are/were generated which will need to be managed in future.

Wastes containing these POPs and other Polybutylene terephthalate (PBT) chemicals need to be managed in an environmentally sound manner. Activities for the management of POPs specific waste are listed in the individual action plans and would be linked to the activities listed in this generic action plan for POPs stockpiles.

The overall goal is to develop and implement a programme to manage the POPs stockpiles/wastes and reduce releases from stockpiles and waste in accordance with internationally accepted guidelines.

**Table 43. Action plan for reduction and elimination of releases from stockpiles and wastes (Article 6)**

Objectives	Activities	Indicators	Implementer
(1) Identification of options and limitations for the destruction and management of POPs and hazardous chemicals in the country and the current and future capacity needs and options	(1.1) Evaluation of the option and limitation of destruction capacity of waste (chemicals and chemicals in products) in the country and in the region	Documentation on destruction capacity	<b>Main Implementer</b> MONREC  <b>Supporting</b> MOPFI, MOALI, CDCs, MOCn, MOHS, MOEE, MOTC, MOE, MOHA
	(1.2) Evaluation of the option and limitation of other ESM measures for POPs containing wastes and chemicals and chemicals in products in the country	Documentation of other ESM options in the country	
	(1.3) Needs assessment for improvement of management and destruction capacity	Develop assessment report	
(2) Developing measures for safe handling, separation and sound disposal of stockpiles of chemical and articles in use and appropriately recovering resources and energy to move to more circular economy.	(2.1) Develop manuals for safe handling and disposal.	Manual for safe handling and disposal is developed	
	(2.2) Develop guidelines for the transport of POPs wastes	Guideline on transport is developed	
	(2.3) Establish collection scheme for POPs containing articles.	Collections scheme for POPs containing products and wastes is established	
	(2.4) Establish appropriate separation, recycling and energy recovery schemes for POPs containing waste.	Separation schemes for waste fractions like e-waste, end of life vehicles, waste wood and waste oils are developed	
(3) Store POPs stockpiles and	(3.1) Identify appropriate storage	Guideline for safe storage is	

Objectives	Activities	Indicators	Implementer
hazardous chemical and wastes in a safe and environmentally sound manner	facilities for interim storage of stockpiles	developed	
	(3.2) Upgrade existing information for safe management of stockpiles	Selected storages for stockpiles/wastes and workshops to train personnel in management of stockpiles	
(4) Destruction, disposal or export of POPs wastes and other hazardous chemicals and waste in an ESM	(4.1) Destruction of POPs containing waste and other hazardous chemicals containing waste in an ESM	POPs and other hazardous chemical waste (including hazardous chemicals in products) managed in ESM	
	(4.2) Possibly disposal of selected POPs containing waste fraction with low leaching risk	-	
Please note: The management of the stockpiles of the individual POPs (PCBs, pesticides, PFOS, POP-PBDEs, HBCD) is included in the action plans of individual POPs above and time frame for General action plan to reduce releases from stockpiles and wastes is shown in Table 51.			

### **3.3.10 Identification of contaminated sites (Annex A, B, and C Chemicals of SC Text) and securing and remediation in an environmentally sound manner**

To date, there is no intergovernmental policy framework instrument that addresses the identification and remediation of contaminated sites. Countries that have ratified the Stockholm Convention (Parties) must however endeavour to develop strategies for identifying sites contaminated with POPs (Article 6). While not explicitly requiring remediation of contaminated sites, the Stockholm Convention stipulates that any remediation attempts must be carried out in an environmentally sound manner (Article 6).

The activities for the identification and assessment of POPs-contaminated sites should be harmonized with the general strategy of Myanmar to assess and remediate contaminated sites and hotspots.

The individual POPs inventories have shown that all POPs groups have resulted or have likely resulted in some contaminated land and more information are stated in Chapter II.

Depending on the pollutant, different securing and remediation technologies might be applied which need to be explored for the individual location and pollutant.

Article 6 of the Stockholm Convention requires that Parties develop appropriate strategies for the identification of sites contaminated with chemicals listed in Annex A, B or C of SC Text and if remediation of such sites is carried out to do it in an environmentally sound manner. The country strategy is as outlined below.

**Table 44. Action plan for identification of contaminated sites (Annex A, B and C Chemicals of SC Text) and securing and remediation in an environmentally sound manner**

Objectives	Activities	Outputs	Implementers
(1) Regulatory frame for contaminated sites	(1.1) Develop/update legislation to set criteria for determining contaminated sites for relevant POPs.	Draft regulation developed on contaminated sites and soils.	<b>Main Implementer</b> MONREC  <b>Supporting</b> MOPFI, MOALI, CDCs, MOCn, MOHS, MOEE, MOTC, MOE, MOHA, Private companies
	(1.2) Establish guidelines for soil and ground water assessment	Draft Legislation on liability (Polluter Pays Principle (PPP)) related to contamination and clean-up	
	(1.3) Legislation on liability (Polluter Pays Principle (PPP)) related to contamination and clean-up procedures.	-	
(2) Methodology to identify and prioritize sites contaminated with Annex A, B and C chemicals of SC Text	(2.1) Develop methodology to systematically identify and prioritize POPs contaminated sites considering available guidance documents <sup>103</sup>	General procedures for investigations developed	
	(2.2) Establish methodology for ground water and soil assessment	-	
	(2.3) Develop list of potential contaminated sites (see individual POPs below)	-	
	(2.4) (Preliminary) prioritization of POPs contaminated sites	-	

<sup>103</sup> See e.g. UNIDO POPs contaminated site Toolkit <http://chm.pops.int/Implementation/BATandBEP/AdditionalResources/tabid/1493/Default.aspx> or UNEP Toolkit Category 10 ([http://toolkit.pops.int/Publish/Main/II\\_10\\_HotSpots.html](http://toolkit.pops.int/Publish/Main/II_10_HotSpots.html)).

Objectives	Activities	Outputs	Implementers
	(2.5) To participate in or to follow the UNEP working group on POPs contaminated sites	Expert nominated for contact/participation UNEP BAT/BEP group	
(3) Secure POPs contaminated sites, and where feasible, conduct remediation of contaminated sites	(3.1) Standard procedures for securing and labelling contaminated sites	Procedures for securing contaminated sites identified and isolated.	
	(3.2) Identify potential remediation technologies available. Develop strategies for the environmentally sound management of POPs contaminated sites	Compilation and selection of available environmentally sound remediation methods (report)	
	(3.3) Train and upgrade skills of personnel in the assessment, securing and remediation of contaminated sites	Draft guidelines on clean up procedures and training of staff on contaminated sites trained by contaminated site expert	
(4) Countrywide database for POPs contaminated sites considering relevant co-pollutants	(4.1) Assessment of database systems for contaminated sites in other countries	Report on database with recommendation	
	(4.2) Selection of database approach and establishing POPs contaminated site database considering co-pollutants integrated in a general contaminated site database	Database selected and established	
(5) Identification, assessment, securing and possibly remediation of POPs pesticides contaminated sites	(5.1) Assessing of potentially POPs pesticides contaminated sites (sites of formulation, storage, use and disposal)	Potential POPs pesticide contaminated sites are assessed, ranked for priority and secured	

Objectives	Activities	Outputs	Implementers
	(5.2) Overall risk assessment of the sites (toxicity of mixture present) <sup>104</sup> and prioritizing sites	-	
	(5.3) Securing of sites and remediation of sites as appropriate	-	
(6) Identification, assessment, securing and possibly remediation of PCB contaminated sites	(6.1) Assessing of potentially PCB contaminated sites (storage, use and disposal PCB equipment)	Potential PCB contaminated sites are assessed, ranked for priority and secured	
	(6.2) Securing of sites and remediation of sites as appropriate	-	
(7) Identification and established assessment and management of potentially POP-BFR (and PBDD/F) contaminated sites and securing /remediation. <sup>105</sup>	(7.1) Develop/update legislation to set criteria for determining contaminated sites. Legislation on liability related to contamination and clean-up procedures. (general activity on contaminated site framework)	-	
	(7.2) Develop methodology and guidelines for risk assessment of sites where POP-BFR containing waste (e.g. WEEE, ELV) were treated considering the toxicity of mixtures.	Method for risk assessment developed	
	(7.3) Database and conceptual site	-	

<sup>104</sup> See for example: Pieterse B, Rijk IJC, Simon E, van Vugt-Lussenburg BMA, Fokke BFH, van der Wijk M, Besselink H, Weber R, van der Burg B (2015) Effect-based assessment of persistent organic pollutant- and pesticide dumpsite using mammalian CALUX reporter cell lines. *Environ Sci Pollut Res Int.* 22:14442-14454.

<sup>105</sup> At sites where WEEE and end of life vehicle and other PBDE containing waste is treated the final pollution is a mixture of many pollutants (Wong et al. 2007). Wong MH, Wu SC, Deng WJ, Yu XZ, Luo Q, Leung AO, Wong CS, Luksemburg WJ, Wong AS (2007) Export of toxic chemicals - a review of the case of uncontrolled electronic-waste recycling. *Environ Pollut.* 149(2):131-140.

Objectives	Activities	Outputs	Implementers
	models of potentially contaminated sites		
	(7.4) Prioritization of the sites (risks) for further assessment and securing.	Best securing and remediation measures identified and personnel trained	
	(7.5) Train and upgrade skills of personnel in the assessment, securing and remediation of contaminated sites	-	
	(7.6) Develop strategies for the environmentally sound management of POP-BFRs contaminated sites.	-	
	(7.7) Take measures to secure the contaminated sites to stop human exposure and environmental releases	-	
	(7.8) Identification of clean-up measures and initiate clean-up procedures starting with high priority sites.	-	
(8) Established assessment, management, database of potentially PFOS and other PFAS contaminated sites and securing /remediation	(8.1) Develop/update legislation to set criteria for determining contaminated sites. Legislation on liability related to contamination and clean-up procedures. (general activity on contaminated site framework)	Contaminated site criteria defined and legislation developed	

Objectives	Activities	Outputs	Implementers
	(8.2) Develop/adopt guidelines for identification and assessment of PFOS/PFAS contaminated sites <sup>106</sup>	Guidelines on identification developed	
	(8.3) Training in identification and management of PFOS contaminated sites	Workshops conducted, staff trained	
	(8.4) Database and maps of potentially contaminated sites and prioritization of the sites (risks) for further assessment and clean-up	Database developed and Priority sites determined	
	(8.5) Analytical confirmation of POPs PFOS/PFAS contamination for the identified locations (according a prioritization list)	Pollution assessed	
	(8.6) Develop strategies for the environmentally sound management of POPs PFOS/PFAS contaminated sites	Strategies for addressing sites developed	
	(8.7) Take measures to secure the contaminated sites to stop human exposure and environmental releases	Measures to secure sites implemented	
(9) Assessment and management of UPOPs contaminated sites	(9.1) Develop/update legislation to set criteria for determining contaminated soils and sediments with dioxins/UPOPs.	contaminated sites are assessed and well managed	
	(9.2) Polluter pays principle for contaminated sites	-	

<sup>106</sup> A handbook on PFOS/PFAS contaminated sites has been developed by the German federal state working group.

Objectives	Activities	Outputs	Implementers
	(9.3) Develop/consider guidelines for identification and assessment of UPOPs contaminated sites	-	
	(9.4) Training in identification and management of contaminated sites	-	
	(9.5) National database of contaminated sites, including prioritization of the sites for assessment and possible clean-up	-	
	(9.6) Assessment/monitoring of UPOPs contamination for the identified locations (considering prioritization list). Develop strategies for the securing and environmentally sound management of dioxin/UPOPs contaminated sites	-	
Time frame for Action plan for identification of contaminated sites (Annex A, B and C chemicals of SC Text) and securing and remediation in an environmentally sound manner is shown in Table 51.			

### **3.3.11 Facilitating information exchange and stakeholder participation**

This activity is supporting and establishing a system for exchanging information on POPs at national, regional and international scale. Referring to Articles 9 and 10 of the Stockholm Convention, the Parties provide the access to information to the community and constantly update the information on POPs.

The information exchange between the Parties of the Stockholm Convention is performed via the National Focal Points and with the support of the Secretariat of the Stockholm Convention.

Regarding the content of the information exchange, the Parties to the Convention exchange information on the activities directed to reduce or eliminate POPs and on the risk imposed by POPs to humans and environment, including the information related to socio-economic costs.

Information exchange and stakeholder involvement are activities to be elaborated for the implementation of the NIP. The development of a comprehensive strategic information exchange and communication plan will be one step to achieve successful implementation of the NIP. The communication plan must also ensure that POPs-management issues will be addressed through various media such as website and other means of communication, in order to raise public awareness and to receive full collaboration. This activity is closely linked with the action plan on awareness raising and facilitating or undertaking information exchange in Chapter III. A national activity for institutional information exchange will be developed through regular workshops to ensure full stakeholder engagement.

Due to the complexity of the increasing numbers of POPs and POPs-like chemicals close information exchange on regional and international level is needed to take place.

**Table 45. Action plan for facilitating information exchange and stakeholder participation**

Objectives	Activities	Outputs	Implementers
(1) Information exchange on POPs regionally and internationally	(1.1) Development of a mechanism that information generated in the Stockholm, Basel and Rotterdam Secretariat and SAICM Secretariat reach the country and the stakeholders.	Information exchange on POPs in the region and internationally is ensured	<p><b>Main Implementer</b> MONREC</p> <p><b>Supporting</b> MOALI, CDCs, MOCn, MOCe, MOHS, MOEE, MOTC, MOE, MOHA, MOPFI, Private sectors (UMFCCI etc.)</p>
	(1.2) Mechanism that information on POPs from the country with regional/ international relevance are communicated to the regional Basel / Stockholm centres and to the BRS secretariat	-	
(2) Assessment of information and documents for national stakeholders	(2.1) Establish mechanism and possibly website that key documents, information and news on POPs and hazardous chemicals can be easily accessed by stakeholders.	Key documents and information are translated and accessible to stakeholders	
	(2.2) Evaluation the Stockholm Convention documents and any selected document should be translated into Myanmar	-	
(3) Improved information exchange on national level between stakeholders	(3.1) Facilitate the dialogue between industry, research and policy makers	Information exchange on national level between stakeholders take place	
	(3.2) Establish and improve dialogue between science community and policy makers for improved science-policy dialogue.	-	
Please note: Time frame for facilitating information exchange and stakeholder participation is shown in Table 51.			

### **3.3.12 Public information, awareness and education (Article 10)**

Article 10 of the Stockholm Convention on awareness, information and education, requires parties to promote and facilitate awareness among policy and decision makers with regard to POPs. Parties should ensure that all available information on POPs is made available to the public and the information is kept up to date. In pursuance of this article, parties should ensure that appropriate education programmes are put in place for groups such as women, children, the least educated, workers, scientists, educators as well as for technical and managerial personnel.

The successful implementation of the Stockholm Convention on POPs in the country will only be achieved when the relevant stakeholders (policy makers, industry, science community, civil society and general population) are sensitised on the nature of POPs, other hazardous chemicals and their effects on human health and the environment. By an appropriate awareness of stakeholders, the needed commitment is reached for the achievement of the Convention objective. It is therefore important for action to be directed at promoting the continuous and detailed awareness, information and training programmes on POPs and hazardous chemicals in products and in the life cycle (SAICM synergy). Information need to be individually developed and targeted for specific stakeholder groups including policy and decision makers, industry as well as the general public. The individual stakeholders should be trained to be appropriately informed to play their respective roles.

The awareness activities will be linked to general awareness activities on chemical safety, public health, green economic development, as well as awareness programs on sustainable consumption and production all of which will aim at broad awareness raising strategies for sustainable development.

A range of suggested awareness activities have been included in the individual action plans of this NIP for pesticides, PCBs, UPOPs, and new industrial POPs (POP-BFRs and PFOS). These activities will be coordinated and addressed collectively where appropriate. In this section, general activities on awareness of POPs and hazardous chemicals are compiled.

**Table 46. Action plan for public information, awareness and education (Article 10)**

Objectives	Activities	Outputs	Implementers
<p>(1) General Awareness on POPs and on POPs-related SAICM issues and general hazardous chemicals as appropriate</p> <p>(For specific awareness activities for individual POPs ) see the respective action plans of individual POPs and coordinate</p>	<p>(1.1) Compile available state of art awareness and education materials on POPs and other hazardous chemicals and GHS</p>	<p>Awareness and education materials on POPs and other hazardous chemicals and GHS compiled</p>	<p><b>Main Implementer</b> MONREC</p> <p><b>Supporting</b> MOALI, CDCs, MOCn, MOCe, MOHS, MOEE, MOTC, MOE, MOHA, MOPFI, Private sectors (UMFCCI etc.)</p>
	<p>(1.2) Adopt education and training materials on POPs &amp; hazardous chemicals tailor made for target groups (policy makers, industry, public, curricula) considering available materials and translate selected materials into the country languages</p>	<p>Education and training materials on POPs &amp; hazardous chemicals tailored to target groups</p>	
	<p>(1.3) Implement trainings and programs for teachers and lecturers about toxicology, environment and ecology issues related to POPs and hazardous chemicals</p>	<p>Trainings and workshops conducted (number participants)</p>	
	<p>(1.4) Providing training and guidance for stakeholder groups that are directly exposed, treating equipment and waste containing POPs (see individual POPs action plans)</p>	<p>Training and guidance for stakeholder groups that are directly exposed, treating equipment and waste containing POPs (see individual POPs action plans) provided</p>	
	<p>(1.5) Implement communication activities, raise awareness on POPs and POP-like chemicals; exchange and dissemination of information on these chemicals in media outlets targeted to</p>	<p>Number communication activities and number of stakeholders reached</p>	

Objectives	Activities	Outputs	Implementers
	stakeholder groups and the public.		
	(1.6) Implement the activities to raise awareness and training for inspectors; customs, environmental police, on the contents related to POPs management	Trainings and workshops conducted	
	(1.7) Integrating POPs and hazardous chemicals in the environmental education syllabus of basic and secondary schools	Updated syllabus of basic and secondary schools	
(2) Raising awareness on POPs & alternatives to POPs and introduction of green and sustainable chemistry approach	(2.1) Compile information materials available on alternatives to POPs and Green and Sustainable Chemistry	Materials compiled (place on POPs website)	
	(2.2) Develop education modules on Green and Sustainable Chemistry versus POPs/POPs-like chemicals for curricula of secondary and tertiary education	Modules for curricula developed and used in secondary and tertiary education	
	(2.3) Develop information materials on Green and Sustainable Chemistry for selected industries	Training on alternatives to POPs considering green and sustainable chemistry (numbers; participants)	
Please note: Time frame for Action plan for public awareness, information and education activities is shown in Table 51.			

### **3.3.13 Effectiveness evaluation (Article 16)**

According to Article 16 (paraphrased): Parties, in accordance with their technical and financial capabilities and using existing monitoring programmes and mechanisms (where possible), are to co-operate on a regional basis, when appropriate, and contribute to a global monitoring programme for the SC. This evaluation shall be conducted on the basis of available scientific, environmental, technical and economic information including national reports. As main matrices selected for assessment of the effectiveness of the implementation, human milk and air have been chosen. These activities are coordinated in the frame of the global POPs activities. UNEP together with WHO and the Stockholm Convention Secretariat are conducting and supporting human milk surveys in developing countries.<sup>107</sup> Myanmar has not participated in the human milk survey and will take further steps to contact to the responsible UN agencies to seek for guidance and funding options.

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<sup>107</sup> [http://www.who.int/foodsafety/areas\\_work/chemical-riskschem/pops/en/index1index.html](http://www.who.int/foodsafety/areas_work/chemical-riskschem/pops/en/index1index.html)

**Table 47. Action plan for effectiveness evaluation (Article 16)**

Objectives	Activities	Performance indicator	Implementers
(1) Conduct a monitoring of POPs in human milk or human blood	(1.1) Monitoring of POPs in human milk or blood considering WHO protocol	Data on POPs in human milk/blood	<b>Main Implementer</b> MONREC, MOHS
(2) Evaluating the effectiveness of the implementation of the Convention by other approach	(2.1) Develop further national performance evaluation criteria.	Criteria developed.	<b>Supporting</b> MOALI, CDCs, MOCn, MOCe, MOEE, MOTC, MOE, MOHA, MOPFI, Private sectors (UMFCCI etc.)
	(2.2) Assessment of the implementation and progress performance	Assessment report	
Please note: Time frame for Action plan for effectiveness evaluation is shown in Table 51.			

### **3.3.14 Reporting (Article 15)**

According to Article 15, Parties are required to report periodically on the measures taken, and on their effectiveness in meeting the objectives of the SC. Article 15 of the Stockholm Convention on POPs mandates parties to report to the Conference of Parties (COP) on measures taken to implement the provisions of the Convention as well as the effectiveness of the measures taken. In addition, each party is to provide to the Secretariat, statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and B of SC Text as well as a list of states from/to which it has imported/exported each of such substances. The article 15 reports provide a substantial input to the effectiveness evaluation of the Convention (Article 16), and are submitted every four years.

This Action Plan therefore aims at collecting/collating all information relevant to the provisions of the Convention and packaging them in a suitable manner for reporting to the secretariat and the COP.

**Table 48. Action plan for reporting (Article 15 )**

Objectives	Activities	Performance indicator	Implementers
(1) Setting up mechanism for article 15 reporting	(1.1) Develop a mechanism for complying with the reporting requirements by submission of reports within the given deadlines	Mechanism established	<b>Main Implementer</b> MONREC (Stockholm Focal Point)  <b>Supporting</b>  MOALI, CDCs, MOCn, MOCe, MOHS, MOEE, MOPFI, MOTC, MOE, MOHA, Private sectors (UMFCCI etc.)
	(1.2) Setting up responsibilities for data compilation and filling the reporting form	Data compiled	
(2) Complying with article 15 reporting	(2.1) Compile information for reporting (updated inventory and other information)	Reporting submitted deadlines met	
	(2.2) Submit report to the secretariat (website)	-	
Please note: Time frame for Action plan for reporting under Article 15 of the Stockholm Convention is shown in Table 51.			

### **3.3.15 Research, development and monitoring (Article 11)**

Article 11 of the Stockholm Convention mandates parties to undertake appropriate research, development, monitoring and cooperation pertaining to POPs. The overall research capacity in Myanmar on POPs contamination in the environment, food or humans is low and virtually not existing. Initial monitoring of POPs pesticides in soils has been conducted in Myanmar. The development of analytical capacity is a major bottleneck in Myanmar.

For POPs research and monitoring, international cooperation with experienced institutions are a promising approach for progress in this topic. The assessment of POPs contaminated sites outlined in this action plan will also result in valuable data which will need to be included in a database compiling POPs data generated in the country.

Wider frame of research and monitoring capacity are needed to address POPs and hazardous chemicals and to select appropriate alternatives to POPs and other hazardous chemicals of concern.

Science–policy interfaces are critical in shaping environmental governance and sustainable development. Science has delivered many assessments, syntheses and reviews to inform on chemical pollution and health effects which could facilitate the conventions' implementation. However, science and other forms of knowledge are not used effectively in policymaking.

This section identifies various activities in addressing the research, monitoring and science-policy needs.

**Table 49. Action plan for research, development and monitoring (Article 11)**

Objectives	Activities	Outputs	Implementers
<p>(1) Developing institutional and research capacity to manage POPs and other hazardous chemicals (SAICM synergy)</p>	<p>(1.1) Identify institutions with the potential to undertake research into POPs and other hazardous chemicals (SAICM Synergy)</p>	<p>Institutions identified</p>	<p><b>Main Implementer</b> MONREC, MOE</p> <p><b>Supporting</b> MOALI, CDCs, MOCn, MOCe, MOEE, MOPFI, MOTC, MOHA, MOHS Private sectors (UMFCCI etc.)</p>
	<p>(1.2) Strengthen national scientific and technical research capacity and infrastructure to gather, evaluate and exchange information on chemicals</p>	<p>Needs of national scientific and technical research capabilities in relation to POPs and other hazardous chemicals established</p>	
	<p>(1.3) Develop networks among identified research institutions on national and international level</p>	<p>Networks established and Researchers participated in international conferences</p>	
	<p>(1.4) Establish capacity on health, exposure and risk assessment to POPs and other hazardous chemicals</p>	<p>Report on exposure and risk assessment for POPs and other hazardous chemicals</p>	
	<p>(1.5) Establish outlets for communicating research and development findings to the public</p>	<p>Science based articles in newspapers and reports on chemicals &amp; waste in TV and radio</p>	
<p>(2) Establishing improved and operative science-policy interface and contributing to decision making</p>	<p>(2.1) Assessment of current science-policy interface in decision making. gaps and improvement need</p>	<p>Gap assessment of science-policy interface (report)</p>	
	<p>(2.2) Establish/improve science policy interface for chemicals and waste/resources for assessing the impact of POPs and hazardous chemicals to the SDGs and SDG-indicators, to ecosystem services and</p>	<p>Compilation of impact of hazardous chemicals to SDGs and related indicators and science-policy assessment report on chemicals and waste/resources</p>	

Objectives	Activities	Outputs	Implementers
	other policy drivers.		
(3) Conducting socio economic assessment, life cycle costing and external cost for policy making	(3.1) Compile information and develop capacity on life cycle cost, external cost and socio-economic analysis of POPs and other hazardous chemicals	Institute or working group with expertise on external costing and socio-economic analysis established.	
	(3.2) Contribute information on life cycle cost, external cost and socio-economic assessment to the science-policy dialogue	Reports and policy documents for key areas and Information reached policy makers and are referenced in decisions and policy and legislation background documents	
(4) Developing appropriate analytical capacity approach for relevant POPs	(4.1) Assessment on analytical capacity need (see individual POPs action plans)	Needs assessment report and evaluation	
	(4.2) Develop laboratory capacity for POPs considered relevant for the country	Laboratories established and staff trained Laboratories accredited for POPs relevant for Myanmar	
	(4.3) Identify cooperation partners for POPs and Polybutylene terephthalate (PBT) research on regional and international level	Regional or international cooperation established	
(5) Monitoring POPs and other relevant Polybutylene terephthalate (PBT) needed for the implementation (see individual action plans)	(5.1) Support the monitoring needs of the action plans of the individual POPs groups (see individual POPs groups)	Sample matrices identified Sampling methods selected Samples collected Reports with analysis results and	

Objectives	Activities	Outputs	Implementers	
		publications in science journals		
(6) Ensure proper generation and management of data	(6.1) Establish procedures for the management of analysis results and other data	Procedure for management of analysis results established		
	(6.2) Consider recognized guidelines for data generation and interpreting monitoring results and presenting monitoring reports	Good Laboratory Practice established and used International standards accredited		
(7) Establishing a mechanism for quality assurance and control of monitoring activities	(7.1) Establish effective quality assurance and quality control system	Protocol for ensuring Quality Control (QC) in place and Procedure for data evaluation developed		
(8) Research on alternatives to POPs by Green & Sustainable Chemistry approaches	(8.1) Compilation of information on alternatives assessment and research on alternatives	Research project into alternatives to POPs		
	(8.2) Develop research into Green and Sustainable Chemistry (G&SC)	Workshops on Green and Sustainable Chemistry (G&SC) Research project on Green and Sustainable Chemistry (G&SC)		
Please note: Time frame for Action plan for research, development and monitoring is shown in Table 51.				

### **3.3.16 Technical and financial assistance (Articles 12 and 13)**

The ability of the country to fulfil its obligations under the POPs Convention depends partly on the provision of adequate financial and technical assistance. Myanmar needs technical and financial assistance and will seek this assistance when implementing its NIP.

The following actions are suggested to enable the country to obtain the financial and technical support required for the successful implementation of activities and actions to be carried out to achieve the POPs overall objectives.

**Table 50. Action plan for technical and financial assistance (Articles 12 and 13)**

Objectives	Activities	Outputs	Implementers
(1) To source for technical assistance towards the successful implementation of the Convention (Article 12)	(1.1) Assess technical needs	Documentation of needs	<b>Main Implementer</b> MONREC, MOE  <b>Supporting</b> MOALI, CDCs, MOCn, MOCe, MOEE, MOTC, MOHA, MOPFI, MOHS, Private sectors (UMFCCI etc.)
	(1.2) Identify sources of technical assistance	List of sources of technical assistance Project proposals prepared and submitted and accepted	
(2) To source for financial assistance towards the successful implementation of the Convention	(2.1) Financial needs assessment	Studies evaluating and demonstrating financial needs	
	(2.2) Identify sources of financial assistance	List of potential donors identified	
	(2.3) Requisition for financial assistance through proposal writing	Number of proposals prepared and submitted	

Please note: Time frame for Action plan for technical and financial assistance is shown in Table 51.

## CHAPTER IV

### 4 Priorities and capacity-building needs and proposals

#### 4.1 Priority areas and capacity building needs

As priority areas for the implementation of the SC, the following topics have been discovered during the NIP development process and the stakeholder workshops and steering committee meetings. The order of the priority areas listed below does not mean a prioritization between the areas.

The SC activities should be linked and harmonized with national plans and priorities and should support the sustainable development of the country. The strategy for implementation of the NIP is to mainstream it into the MSDP and support the implementation of the MSDP. There are several goals and related pillars and strategies of MSDP which can be supported by the NIP. The links to the Sustainable Development Plan of Myanmar is shortly highlighted for individual priorities.

Where possible and appropriate, the implementation of the SC should also seek synergies with the implementation of other chemical Conventions and SAICM.

A large share of activities in the different action plans are addressed by these high priority areas. All activities are not repeated in this summary of priorities but can be found in the action plans described for the different areas and are listed in the action plan tables in Chapter III.

##### 4.1.1 Strengthening the coordination between institutions and stakeholders and development of capacity and knowledge in the relevant committees

A strong coordination mechanism between the different ministries, institutions and other stakeholders is needed for an effective implementation of the action plan and for general hazardous chemical and waste management.

The coordination mechanism for the NIP implementation is the topic-related committees of the National Environmental Conservation and Climate Change Central Committee and the supervision committees in the states/regions. Capacity for POPs and hazardous chemicals and hazardous waste need to be developed in the related coordination groups to the topics. Also support is needed including the link to communication of outcomes on provincial and city level and education of implementation.

This capacity building and the strengthening and development of cooperation between the different ministries, institutions, industry, research/education and other stakeholders is an important factor for an effective implementation of the Stockholm Convention NIP and other conventions on chemical and waste including SAICM (synergy approach) and therefore a priority. Such a coordination mechanism should facilitate the

overall management of chemicals and waste and link it to sustainable development agenda and implementation of the SDGs.

The activity contributes to SDGs 3, 4, 11, and 16. It can also contribute to SDGs 8 and 9.

**Time frame:** This activity should start as soon as possible considering that also capacity needs to be built in the country regions and provinces.

#### **4.1.2 Development of legislation and related implementation**

Improvement and development of legislation on POPs and general chemicals and their management is needed. While POPs pesticides are largely banned in Myanmar, there is a lack of legislation for industrial POPs. Also an improved legislation for wastes containing POPs and general hazardous waste management is needed. A range of waste fractions potentially containing POPs need particular control and regulatory frames for their management (e.g. PCB equipment; e-waste and related plastic; end-of-life vehicles, waste oils, waste wood). Here the activities should be coordinated/ mainstreamed with the Master Plan for Hazardous Waste Management.

Where gaps have been discovered appropriate legislation should be developed. This is detailed for POPs in the respective action plans in 3.3. This contributes to Goal 3 of the MSDS in particular to Strategy 3.6: “Build a priority infrastructure base that facilitates sustainable growth and economic diversification” and also to Goal 4 in particular to Strategy 4.5 Protect the rights and harness the productivity of all. And Goal 5 in particular Strategy 5.1: “Ensure a clean environment together with healthy and functioning ecosystems”.

There is a need for institutional strengthening in the area of chemical and waste possibly with employment of additional staff for chemical and waste management to have the necessary capacity for the needed national tasks. Also other ministries need institutional strengthening for chemical and waste management. This strengthening of institutions is needed for the development of the appropriate legislation and regulation and for the implementation of the regulatory framework and the action plans.

The activity contributes to SDGs 3, 4, 8, 9, 11, 12 and 16.

**Time frame:** This activity should start as soon as possible for development of the different legislation with long term tasks over 10 years considering that the development of implementation capacity takes long time and is a continuous process.

#### **4.1.3 Capacity building, research, education, information and awareness raising**

The overall research capacity and awareness in Myanmar on POPs in general and contamination in the environment, food or humans is low or virtually not existing. The

development of research on POPs and pollutants but also research on waste management and recycling is relevant including the science-policy dialogue on chemicals and waste but it is also a necessary base for the sustainable development of Myanmar. The development of research capacity on POPs and general chemicals and waste contributes to the MSDP in particular GOAL 4: “Human Resources & Social Development for a 21<sup>st</sup> Century Society” including Strategy 4.1 of MSDP: “Improve equitable access to high quality lifelong educational opportunities”. If research capacity and analytical/monitoring capacity are developed in the private sector then the activities also contribute to Strategy 3.6 of MSDP: “Build a priority infrastructure base that facilitates sustainable growth and economic diversification” and Strategy 3.7 of MSDS: “Encourage greater creativity and innovation which will contribute to the development of a modern economy”.

For all POPs groups (pesticides, unintentional POPs, PCBs, PFOS and related substances, POP-PBDEs, HBCD education and awareness raising activities are needed. This includes the education and awareness of the public but also of policy makers and individual stakeholder groups including those particularly exposed.

The awareness on POPs would best be integrated in a general education and awareness on hazardous chemicals and related risks and health impacts. This also should include awareness and education on waste management for policy makers, relevant stakeholders and the public. Synergies with other chemical and waste conventions should be elaborated with a common but differentiated approach.

Since some of the new industrial POPs are present in consumer products (electronics, vehicles, synthetic carpets, treated textiles, furniture, mattresses, etc.), the awareness raising materials and awareness communication can nicely be linked to sustainable consumption and production.

The activity contributes to SDGs 1, 2, 3, 5, 8, 9, 12, and 16.

**Time frame:** This activity should start as soon as possible. It includes actions on awareness raising which are short term. The development/improvement of curricula takes longer and can be considered medium-term capacity building on POPs. General chemical and hazardous waste management is a continuous process which will continuously be addressed in future to support the MSDP.

#### **4.1.4 Environmentally sound management of POPs stockpiles (PCBs, pesticides; POP-PBDEs, HBCD and PFOS)**

The management of existing POPs stockpiles is considered a priority to protect human health and the environment. This is an important contribution to Strategy 5.1 of MSDP: “Ensure a clean environment together with healthy and functioning ecosystems”. This also contributes to Strategy 4.4 of MSDP “Increase secure access to food that is safe”

and to 4.5.5 “Protect labour rights and promote safe and secure working environments for all workers”.

Management capacity for POPs and generally hazardous waste in Myanmar needs to be built and the limitations and options for destruction capacity in the country need to be assessed and developed. This contributes to Goal 3 Job Creation & Private Sector-led Growth in particular strategy 3.2: “Support job creation in industry and services” and to Strategy 3.6: “Build a priority infrastructure base that facilitates sustainable growth and economic diversification”. This also is an important contribution to Goal 5 in particular Strategy 5.1: “Ensure a clean environment together with healthy and functioning ecosystems”.

Of particular relevance is the management of the PCBs in current use and stocks with large risk for humans, the environment and food.<sup>108</sup> The total volume of PCB stockpiles need to be assessed and the option of destruction or export evaluated. Considering that approximately 20% of the analysed PCB oils contained PCBs above 50 ppm the volume to treat is large.

The POPs-pesticide stock (23 t of DDT) need also be managed and destroyed or exported.

Large stocks of POP-BFR containing wastes are present in plastics and polymers of e-waste, end-of-life vehicles, insulation in construction and other uses. While the exposure risk is normally lower compared to PCBs or pesticides, these materials are “fuel” for landfill fires and backyard burning with associated releases of POPs, unintentional POPs, particulate matter and carbon black. Furthermore, these plastics and polymers are sources for marine litter and associated pollution.

PFOS stocks in particular in firefighting foam are a threat to ground water, drinking water and soil and the use need to be stopped and stocks managed appropriately. Also PFOA stockpiles and wastes are likely present. Furthermore, PFAS is an emerging issue of concern under SAICM and should be addressed in a synergistic way.

The activity contributes to SDGs 3, 12, 14 and 15.

**Time frame:** This activity should start as soon as possible and for PCBs the inventory development by screening should be continued. The management of the DDT stockpile can be short time (within 2 years) however there is no particular time pressure since the stocks are securely stored. The management of PCBs will likely take at least 5 years and need to be finalized by 2028. The management of POP-BFR containing stocks

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<sup>108</sup> Weber R, Herold C, Hollert H, Kamphues J, Ungemach L, Blepp M, Ballschmiter K (2018) Life cycle of PCBs and contamination of the environment and of food products from animal origin. *Environ Sci Pollut Res Int.* 25(17), 16325-16343.

in particular in construction can take many decades and up to a century<sup>109</sup> considering the use duration in this application.

#### **4.1.5 Improvement of waste management and introduction of waste hierarchy towards (more) circular economy and reduction of unintentionally formed POPs from open burning**

Open waste burning is a main source of PCDD/F and other unintentional POPs release. Also Myanmar does not have an appropriate capacity for management and destruction of POPs waste. Therefore, such capacity needs to be developed as otherwise POPs containing wastes (PCBs; pesticides) require expensive export. New industrial POPs (in particular PBDEs, HBCD, PFOS and SCCPs) can be present in several large waste streams (electronic waste, car shredder residues, treated synthetic carpets, textiles, rubber, and Polyvinyl chloride (PVC) etc.). These wastes are currently largely disposed in dumpsites. Therefore, and considering other contaminants (e.g. heavy metals) in the waste, the lack of waste management presents a serious threat to soils and related food safety (SDGs 2,3,6, 11,12)<sup>110</sup>, to ground water, and the wider environment.

The improvement of waste management is, therefore, of high priority for current and future control of unintentionally produced POPs release and for the management of new industrial POPs in waste streams. This includes also the development of an overall concept to finance waste management.

Furthermore, the introduction and implementation of the waste hierarchy towards a more circular economy is crucial for recovery of valuable resources contributing to sustainable consumption and production and it contributes to the reduction of GHG emission and carbon footprint.

This contributes to Goal 3 Job Creation & Private Sector-led Growth in particular strategy 3.2: “Support job creation in industry and services...” and to Strategy 3.6: “Build a priority infrastructure base that facilitates sustainable growth and economic diversification”. This also is an important contribution to MSDP Goal 5 in particular Strategy 5.1: “Ensure a clean environment together with healthy and functioning ecosystems”.

The improvement of waste management and the implementation of the waste hierarchy towards a (more) circular economy therefore contribute to the integrated approach to tackling interconnected issues and generating multiple benefits as aimed in the GEF 7 strategy. At the same time increased recycling leads to job creation and generation

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<sup>109</sup> Li L, Weber R, Liu J, Hu J (2016) Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. *Environ Int.* 91, 291-300.

<sup>110</sup> Bell et al (2016) Assessment of POPs contaminated sites and the need for stringent soil standards for food and feed safety. Working document for UNEP Dioxin Toolkit and BAT/BEP group. October 2016.

and involvement of green and sustainable industries and therefore can catalyse private sector activities.

The activity contributes to SDGs 1, 2, 3, 6, 8, 11 and 12.

**Time frame:** This activity should start as soon as possible. The management of the dichlorodiphenyltrichloroethane (DDT) stockpile can be short time (within 2 years) while the management of PCBs will likely take at least 5 years and need to be finalized by 2028. The management of POP-BFR containing stocks in construction can take decades and up to a century considering the use duration in this application.

#### **4.1.6 BAT/BEP for dioxin/UPOPs reduction and integrated pollutant prevention and control**

In Myanmar most of the facilities which are listed in Annex C of SC Text with PCDD/F release (healthcare waste incinerator, iron smelter, cement kilns) do not comply with BAT/BEP. The improvement of technology for hospital waste incinerators and other facilities with relevant PCDD/F release is a priority to reduce total PCDD/Fs and other UPOPs.

The Stockholm Convention BAT/BEP guidance stresses the integrated pollution prevention and control as mentioned as a general guiding principle. The approach of Myanmar is that the implementation of BAT/BEP should contribute to the overall reduction of pollution release (UPOPs, heavy metals, particulate matter) and is an important cornerstone for the overall reduction and control of soil, air and water pollution.

This contributes to Goal 3 Job Creation & Private Sector-led Growth in particular Strategy 3.6: “Build a priority infrastructure base that facilitates sustainable growth and economic diversification” and Strategy 3.2: “Support job creation in industry and services...” needed to develop, operate and maintain BAT/BEP. This prevention of pollution release is also an important contribution to Goal 5 in particular Strategy 5.1: “Ensure a clean environment together with healthy and functioning ecosystems”.

BAT/BEP also can contribute to reduction of energy consumption and related reduction of GHG emission.

BAT/BEP with an integrated pollution prevention and control approach of facilities and industries therefore contribute to the integrated and system approach to tackling interconnected issues and generating multiple benefits as aimed in the GEF 6 and 7 strategy<sup>112</sup>.

The activity contributes to SDGs 2, 3, 6, 11 and 12 and can contribute to SDGs 1 and 8 in particular if local working force and technologies are used where possible and appropriate.

**Time frame:** Some of these activities should start as soon as possible in particular on hospital waste incinerators where currently activities are planned in Yangon and Mandalay. BAT activities in industries can be considered medium- to long-term activities without a specific urgency.

#### **4.1.7 Monitoring of POPs, effectiveness evaluation and collaboration**

There is a lack of analytical and POPs monitoring capacity in Myanmar. For the implementation of the Convention, levels of POPs in the human body are needed for effectiveness evaluation and support for priority setting. POPs monitoring is needed for assessment of POPs in products, the assessment of contaminated sites, contaminated drinking water or the implantation of BAT/BEP and release control. These activities should be combined and lead to the establishment and improvement of POPs and hazardous chemical research and international collaboration also contributing to science-policy advice.

The activity contributes to SDGs 3, 4, 5, 6, 8, 11, 12, 14 and 16.

**Time frame:** This activity will likely start soon within the Norwegian project (NIVA) but is a long-term activity over 10 years considering that the development of laboratories as well as the capacity building of staff take time.

#### **4.1.8 Substitution of POPs and selection of green/sustainable alternatives to promote circular economy**

Some of the new listed POPs including shortchain chlorinated paraffins (SCCPs, PFOS/PFOA, DecaBDE and HBCD) are still used in products (insulation foams, textiles, Polyvinyl chloride (PVC), rubber) or in processes (e.g. lubricants, metal working oils, fat liquoring) and increase the total POPs stockpiles and waste increasing future exposure, management challenge and cost. Therefore, assessment and substitution of POPs and POPs-like chemicals are needed. Strengthening of capacity for assessment of alternative and selection of green and sustainable chemicals or non-chemical alternatives is needed to avoid regrettable substitution.<sup>111</sup>

This activity also contributes to GEF Strategic Priorities<sup>112</sup>.

Considering the SAICM synergy and that Myanmar is an agricultural country, also highly hazardous pesticides (HHPs) and other pesticides with serious health and environmental threats should be substituted by more sustainable alternatives, IPM and

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<sup>111</sup> Fantke P, Weber R, Scheringer M (2015) From incremental to fundamental substitution in chemical alternatives assessment. Sustainable Chemistry and Pharmacy 1, 1-8.

<sup>112</sup> GEF (2017) GEF-7 REPLENISHMENT OVERVIEW: GEF-7--GLOBAL CONTEXT AND STRATEGIC PRIORITIES. December 22, 2017, GEF/R.7/11

organic agriculture. This is highly important for biodiversity/ecosystem preservation and contributes to MSDP Strategy 5.1: “Ensure a clean environment together with healthy ecosystems” and Strategy 4.4 “Increase secure access to food that is safe and well-balanced”.

Furthermore the substitution of highly persistent and water soluble PFOS, PFOA and other PFAS (SAICM synergy) contribute to Enhancing Water Security (GEF International Water Focal Area).

The activity contributes to SDGs 3, 4, 6, 8, 9, 12, 14 and 16. The use of green and sustainable chemicals also contributes to SDGs 2, 14 and 15.

**Time frame:** This activity should start as soon as possible in particular considering of the new POPs currently in use and the uncontrolled import of pesticides with unclear labelling. This activity is considered continuous since new chemicals are invented continuously and also are continuously introduced to the market.

#### **4.1.9 Contaminated site assessment and management**

The assessment and inventory in this NIP revealed that for all POPs groups (pesticides, PCBs/PCNs, dioxin/UPOPs, PFOS and PBDEs) a range of sites are possibly or likely contaminated.

Assessment and management contribute to MSDP Goal 5 in particular Strategy 5.1: “Ensure a clean environment...”.

Contaminated sites negatively impact several SDGs including 3, 6, 11, 14 and 15.

Currently, there was only a preliminary measurement of pesticide contaminated soils. Therefore, it is of high priority to initiate a more comprehensive assessment, mapping and securing of POPs and other contaminated sites. In particular sites with potential contamination of ground and drinking water with PFOS or sites where food producing animals are grazing/feeding. The activities should result in the establishment of a database of contaminated-sites. Therefore this priority/activity also contributes to MSDP Strategy 4.4 “Increase secure access to food that is safe...”

The activity contributes to SDGs 3, 6, 11, 14 and 15.

**Time frame:** The main activities can start in a few years after development of a regulatory frame and analytical capacity. Only the assessments of contaminated ground water and drinking water reservoirs should start as soon as possible in cooperation with partner laboratories in countries where cooperation exists. Otherwise the activity is long-term considering the experience made in other countries.

## **4.2 Time frame for the implementation strategy and action plans**

For the priority areas listed above in 4.1, considerations on the time frame are included in the individual action areas. Most of the priority activities should start as soon as practical.

The individual time frames for action plans and activities were developed and compiled in the time table shown below with short-term (until 2021), mid-term (until 2025) and long-term (until 2030) activities.

**Table 51. Time frame for implementation strategy and action plans**

No.	Action Plan	Time Frame		
		Short Term (2021-2022)	Mid Term (2023-2025)	Long Term (2026-2030)
1.	Institutional and regulatory strengthening measures			
2.	Import and export, use, stockpiles, and wastes of POPs pesticides (Annex A of SC Text) and highly hazardous pesticides (HHPs; SAICM synergy)			
3.	Import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemicals of SC Text)			
4.	Elimination and management of POP-BFRs (PBDEs, HBCD and PBB); including timelines, responsible authorities and stakeholders			
5.	Import and export, use, stockpiles and wastes of DDT (Annex B chemical of SC Text)			
6.	Measures to reduce or eliminate PFOS and control PFAS (SAICM Synergy)			
7.	Register for specific exemptions and continuing need for exemptions (Article 4)			
8.	Reduction and elimination of dioxins/UPOPs			
9.	Reduce releases from stockpiles and wastes (Article 6)			
10.	Identification of contaminated sites (Annex A, B and C chemicals of SC Text) and securing and remediation in an environmentally sound manner			
11.	Facilitating information exchange and stakeholder participation			
12.	Public awareness, information and education activities			
13.	Effectiveness evaluation (Article 16)			
14.	Reporting under Article 15 of the Stockholm Convention	4 year cycles		
15.	Research, development and monitoring (Article 11)			
16.	Technical and financial assistance (Articles 12 and 13)			

### 4.3 Resource requirements

For the priority areas, tentative budget requirements have been estimated and shown in above Table. Details on funding requirement will be elaborated during the respective development of projects. Myanmar is aware that the financial resources from GEF and other UN funding do not sufficiently cover the full implementation costs; hence, co-funding has to be considered. Therefore, potential sources of funding need to be identified.

By mainstreaming of the NIP into Myanmar's Sustainable Development Plan a range of priority activities supporting the implementation of the MSDP can be co-funded (see Priority areas and capacity building needs in Chapter IV for the interrelationship of priority activities of NIP of SC and the goals and strategy areas of the MSDP).

The Government should create a legal basis and favourable conditions to encourage and attract the participation of all related economic sectors, domestic and foreign organizations, as well as investors for the implementation of the National Plan. In addition, National Plan implementing authorities should take maximum advantage of the financial resources allocated by international financial organizations and other countries by conducting appropriate campaigns to attract capital from donors for the National Planning, creating a legal basis for encourage international sponsorship.

This framework will take into consideration and identify specific human resources, stakeholder contributions and requirements for possible GEF incremental cost and funding by development/donor partners. Considering the larger share of co-funding needed for GEF projects, appropriate and robust co-funding sources and approaches are needed. Following approaches and strategies are considered for co-funding:

The NIP of SC will be coordinated and mainstreamed where appropriate with other related national plans and programs in particular Myanmar National Hazardous Waste Management in Master Plan (with co-funding from the Norwegian project), MSDP, climate change, plans on resources management, or programs or projects on science and technology, in order to attract investments and increase capital efficiency. By linking to general chemical and waste management co-funding can partly come from national budgets dedicated to chemical and in particular to waste management.

For the management of POPs contaminated stocks and wastes, Extended Producer Responsibility (EPR) contributions can become an important funding source for the environmentally sound management of waste fractions. Several waste fractions related to POPs could be addressed by an extended producer responsibility frame:

- (1) PCBs and related equipment;
- (2) E-waste including e-waste plastic;
- (3) End of life vehicle (including the polymers);

- (4) Empty pesticides containers and stockpiles;
- (5) Synthetic carpets.

The implementation of extended producer responsibility needs the development of a respective policy and regulatory frame. Such a frame is already existing in some countries for some of the categories and the OECD has developed related information.<sup>113</sup>

Owners of POPs waste have to contribute a share of the management cost:

- (1) Owners of PCBs (utility sector) have major responsibility for a large share of the PCB containing transformers and other equipment;
- (2) Owners of buildings with POPs containing insulation foams, sealants or paints;
- (3) PFOS firefighting foams;
- (4) End of life vehicle (including the polymers).

Since a range of POPs and other pollutants are included in consumer products, also the consumers need to bear a part of the cost by appropriate waste management fees.

In the set-up of funding of the waste management also the value of the waste needs to be considered as co-financing source. E.g. vehicles have an inherent value (200 to 400 US\$) mainly from metals and this value should be used to also manage the non-valuable fraction of plastic and other polymers and pollutants. Also certain e-waste fractions have a value and can contribute to the finance of e-waste management. This requires the development of a waste management frame which does not allow to just pick out the valuables like metals (“cherry picking”) without consideration on managing the remaining non-valuable fractions.

The improvement or establishment of recycling and recovery schemes also can contribute to financing of waste management including POPs management. E.g. from experience in Europe, more than 50% of e-waste plastic can be recycled after separation with a reasonable price for the separated plastic fraction. The separation of recyclable plastic at the same time reduces the volume of the plastic fraction which need to be treated/disposed.

The polluter pays principle (PPP) can be used in the area of contaminated sites and hot spots. Before the principle can be applied the related regulatory frame need to be set-up that PPP can be used as co-financing source.

Overall, the NIP will be implemented through mobilization of various finance resources such as state budget, bilateral grant aid, GEF grants, financing from organizations and individuals, extended producer responsibility contribution, polluter pays

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<sup>113</sup> OECD resources <http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm>

principle contributions, loan, improved resource recovery from wastes, and other appropriate options.

Strengthening international cooperation should be carried out in various areas such as technical cooperation, grant aid for project development, improve capacity, institutional improvement, supporting under projects, resolving health and social benefits problems for the stakeholders.

The elaboration, allocation, and cost estimate decisions, as well as the management, use and settlement of funds for implementation of the National Plan will be conducted transparent in accordance with regulations.

Following Table gives an overview on budget estimates for priority activities for POPs management in Myanmar. These budgets are indicative and a rough estimate. Some of the activities cannot be estimated since the necessary data are not available E.g. the cost for the PCB management can only be estimated after the amount of PCB containing transformers, capacitors and other wastes is known based on a detailed inventory. Also, the cost for the management of PBDEs can only be calculated within the overall management of e-waste, end-of-life vehicles and other impacted wastes. Only after such a frame is established and the approach for plastic/polymer management from e-waste and ELVs is clarified (separation/recycling or just disposal or energy recovery in e.g. cement kiln) the cost for the treatment of POP containing plastic/polymers can be calculated.

As described above, the financing of the suggested budget would be a mix of governmental funding, international funding and funding from industries and citizens. E.g. the estimated cost for contaminated site assessment would come also from the owner of potentially contaminated sites like the airport.

Furthermore, the proposed activities can partly be financed by the regular waste management budget since PBDEs in e-waste or end of life vehicles belong to the general waste management tasks of the country. Here funding can come largely from extended producer responsibility and for vehicles and some of the electronics co-funding can (partly) come from the value of the resources in the waste.

Furthermore integrated implementation with other national and internationally funded activities can be co-funding source. The Norwegian project on hazardous waste management should be linked to the activities where appropriate. A range of activities like the coordination mechanism, strengthening institutions, regulatory development and implementation of chemical and waste management can be done in a synergistic and integrated manner with related co-funding considerations.

**Table 52. Estimated budget for priority activities for POPs management in Myanmar**

<b>Priority Activities (details are in individual action plans)</b>	<b>Tentative Budget estimate (USD)</b>
<b>Coordination, institutional strengthening, regulatory development and implementation</b>	
Coordination between ministries, institutions and stakeholders for POPs, hazardous chemicals and waste management (SAICM synergy)*	300,000
Strengthening governmental institutions on POPs and hazardous chemicals including additional employment of staff (SAICM synergy)*	1,000,000
Development of policy, legislation and regulatory framework (SAICM synergy)*	800,000
Capacity building for the implementation of the regulatory framework	500,000
<b>Education, information and awareness raising*</b>	
Information and awareness raising on POPs, hazardous chemicals and chemistry <sup>114</sup> for the general population of all ages (SAICM synergy)	500,000
Education and capacity building for policy makers and authorities on POPs and hazardous chemicals (SAICM synergy).	300,000
Education and capacity building for industry on POPs and other hazardous chemicals, GHS (SAICM synergy).	300,000
Education and awareness on POPs and other hazardous chemicals in curricula (school and university)	400,000
*Please note: Education and capacity for experts is in individual priority action below	
<b>Management of POPs stockpiles (PCBs/PCNs, pesticides; POP-PBDEs, HBCD and PFOS)</b>	
Assessment of options for destruction/management of POPs containing waste in Myanmar or the region or overseas and developing frameworks	250,000
Develop technical capacity for management of POPs pesticide wastes (including HHPs and empty containers)	300,000
Management of the DDT stockpile	200,000
Inventory development of PCBs	200,000
Knowledge and technical capacity for the management of PCBs	250,000
Management and destruction of PCBs in transformers and other wastes	Estimate after robust inventory
Knowledge and technical capacity for management of POP-BFRs containing waste (plastic in WEEE, ELVs, others)	500,000

<sup>114</sup> The use of functional chemicals is necessity in daily life. In addition to education on the risks of POPs and other hazardous chemicals, also the basics of chemistry of chemicals used in everyday life could be included in the education including benefits and drawbacks for informed decisions on use.

<b>Priority Activities (details are in individual action plans)</b>	<b>Tentative Budget estimate (USD)</b>
Management of POP-PBDE containing waste (Basel Convention synergy)	Within the management of WEEE and ELVs (see below)
Management of HBCD containing stock (Basel Convention synergy)	Estimate after refined inventory and stop of further use
Education and capacity for management of PFOS and other PFAS (SAICM; Basel Convention synergy) containing waste (firefighting foams, carpets, treated textiles, furniture, paper etc.)	200,000
Management of PFOS containing waste	Estimate after decision if PFOS foams/waste need destruction
<b>Reduction of unintentionally formed POPs and management of POPs in consumer products by improvement of waste management and introduction of the waste hierarchy</b>	
Improvement of waste management of waste categories containing POPs which can be recycled for a large clean share (e.g. WEEE plastic; ELV polymers, waste oil, waste wood, synthetic carpets)	Cost depend on recovery of cost by recycling, reuse & reduction
Overall improvement of waste management for reduction of open burning of dumps/landfills and on private level	Cost depend on recovery of cost by recycling, reuse & reduction
Awareness, education and capacity building of stakeholders (authorities, industries, NGOs and the public) on reduction, reuse and recycling (3R), waste separation, and circular economy	500,000
Development of a university curricula on waste and resource management	750,000
<b>BAT/BEP for dioxin/UPOPs reduction and integrated pollutant prevention and control</b>	
Development of knowledge and technical capacity for the control and reduction of PCDD/Fs and other UPOPs	200,000
Implementation of BAT/BEP for UPOPs reduction from healthcare waste incinerator	Cost estimate need a detailed assessment
Implementation of BAT and/or BEP for UPOPs reduction in other sectors (metal industry, cement production)	Cost estimate need a detailed assessment of facilities
<b>Monitoring of POPs, effectiveness evaluation and initiate research and collaborations</b>	
Update inventories including measurements, databases for POPs, hazardous chemicals, pollutant releases/PRTR (SAICM synergy)	300,000
Knowledge development for analysis/monitoring of POPs and other priority pollutants (SAICM synergy)	500,000
Development, improvement and coordination of technical analytical capacity	1,000,000
Network development and cooperation with international partners for monitoring and assessment of POPs and POPs-like chemicals	250,000
Monitoring projects in priority area.	500,000
<b>Substitution of POPs and selection of green and sustainable alternatives</b>	

<b>Priority Activities (details are in individual action plans)</b>	<b>Tentative Budget estimate (USD)</b>
Capacity building and curricula for the assessment of alternatives chemicals and non-chemical alternatives and green/sustainable chemistry	200,000
Substitution of POPs in use (SCCPs, PFOA, PFOS, DecaBDE, HBCD) and other POPs-like chemicals by green and more sustainable chemicals and non-chemical alternatives	Estimate after assessment of recent listed POPs in use
<b>Contaminated site assessment and management</b>	
Capacity building for the assessment, inventory, securing and remediation of POPs contaminated sites	200,000
Database for (potentially) contaminated sites	100,000
Assessment of pesticides contaminated sites	400,000
Securing and possibly remediation of pesticides contaminated sites	Estimate after assessment
Assessment of PCB contaminated sites	400,000
Securing and possibly remediation of PCB contaminated sites	Estimate after assessment
Assessment of potential PFOS/PFOA contaminated sites	750,000
Securing and possibly remediation of PFOS/PFAS contaminated sites and cleaning of drinking water if pollution discovered	Estimate after assessment
Assessment of POP-BFR contaminated sites	100,000
Securing and possibly remediation of POP-BFR contaminated sites	Estimate after assessment
Assessment of potential dioxin/UPOPs contaminated sites	300,000
Securing and possibly remediation of dioxin/UPOPs contaminated sites	Estimate after assessment