PETROLAB SERVICES
independent laboratory

National PCBs Management Plan

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GLOSSARY

Best Available Technique (BAT)	**:**	Available techniques which are the best and advanced for preventing the release of chemicals to the environment and the impacts on the environment.
Best Environmental Practices (BEP)	:	The application of the most appropriate combination of environmental control measures and strategies.
B3 (Bahan Berbahaya dan Beracun)	:	Hazardous and toxic substance
Destruction Removal Efficiency (DRE)	:	A percentage that represents the number of molecules of a compound removed or destroyed in an incinerator relative to the number of molecule that entered the system. For example, a DRE of 99.99 percent means that 9,999 molecules are destroyed for every 10,000 that enter).
Elimination of PCBs	:	The removal of PCBs
Timbulan limbah	:	The amount of waste being generated
Polychlorinated Biphenyls (PCBs)	:	One of hazardous and toxic substance and an organic chlorine compound. It is a persistent organochlorine.
Limbah B3	:	Hazardous and toxic waste (B3 waste)
Persistent Organic Pollutants (POPs)	:	Toxic chemicals (organic pollutants) that persist for long periods of time, are not easily decomposed through physical, chemical and biological processes so that they last a long time in the environment as pollutants.
Pengelolaan PCBs **(PCBs management)**	:	Activities that include reduction, storage, and/or processing of PCBs
Pengelolaan Limbah B3 yang berwawasan lingkungan **(Environmentally sound management of hazardous and toxic waste)**	:	Implementation of practical measures to ensure hazardous waste is managed in a way that will protect human health or environment.
Retrofilling transformator	:	Techniques for cleaning/reducing PCBs in active transformers to concentrations below 50 ppm.

BACKGROUND

The formulation of the National *Polychlorinated Biphenyls* (PCBs) have accommodated the concerns and insights from stakeholders through discussions, interviews and meetings. This document is a living document that needs to be continuously reviewed and updated. The National PCBs management plan consists of 5 (five) chapters and 3 (three) annexes. The summary of each chapter is as follows:

a) **Chapter I: Introduction**
   This chapter describes the Indonesian government's commitments for the phasing out of PCB based on the Stockholm Convention and also the scope of this document.

b) **Chapter II: National Regulatory Framework on Environmentally Sound Management of PCBs**
   This chapter will analyze the current regulatory framework and the challenges towards environmentally sound management of PCBs.

c) **Chapter III: Inventory and Data Extrapolation**
   This chapter will discuss the result of inventory and data extrapolation. The profile of the PCBs contaminated equipment and dielectric oil and their distributions in Indonesia will be elaborated.

d) **Chapter IV: National Action Plan for PCBs Management**
   This chapter is intended to assist Indonesian government and stakeholders to prepare, to plan and to conduct activities in order to eliminate and phase out the PCBs in transformers and dielectric oils identified from inventory activities. In the process of formulating this action plan, the Indonesia National Implementation Plan 2008 and 2014 on Convention Stockholm had been reviewed and its concerns regarding PCB issue has been elaborated in this national action plan. Some of the concerns are building the capacity of laboratories and waste treatment facilities to handle PCB contaminated stockpiles.

e) **Annexes**
   The annexes consist of: National Action Plan on PCB Management, PCBs *Code of Practice*, Operational Procedure for the Management of Equipment and Material Containing PCBs, and a statistical report regarding 2nd Phase of Extended PCBs Inventory in Indonesia. The Ministry of Environment and Forestry (MoEF) and other stakeholders can refer to these documents to conduct environmentally sound management of PCBs.

CHAPTER I

National PCBs Management Plan

1. Introduction

The Government of Indonesia has ratified the Stockholm Convention through Law No. 19/2009 regarding the Ratification of the Stockholm Convention on Persistent Organic Pollutants (POPs). This convention aims to reduce and eventually eliminate the production and the use of persistent organic pollutants and manage its stockpiles in environmentally sound manner[1]. As a consequence of ratifying the Stockholm Convention, the Government of Indonesia (GoI) is obligated to implement the mandates of the convention.

One of the mandates of the Convention is the elimination of the use of PCB in equipment (e.g. capacitors, transformers or other receptacles containing liquid stocks) by 2025. In addition, the environmentally sound waste management of liquids and equipment containing PCB greater than 50ppm (PCBs > 50 ppm) should be done no later than 2028[2].

In 2008, Indonesia submitted the National Implementation Plan (NIP) to the Stockholm Convention Secretariat. The document was updated in 2014 and submitted to the Stockholm Convention Secretariat. In order to follow up the NIP, the Government of Indonesia (GoI) conducted the first phase of PCBs inventory from October 2015 to May 2016, with a total sample of 3,015 transformers from a number of locations on the island of Java.

Later, the second phase of PCBs inventory was conducted in May 2019 to June 2020 with a total sample of 1,509 (one thousand five hundred and nine). The first phase of inventory involved 1033 participants, while the second phase of inventory involved 62 (sixty-two) participants (private companies that own transformers). Those companies were spread across twelve provinces in Java and Sumatra. The total samples from the Phase 1 (one) and 2 (two) inventories were 4,524 and the total participants were 1095 companies.

Besides the inventories aforementioned, Indonesian state owned electricity company (*Perusahaan Listrik Negara*/PLN) had conducted an independent PCBs national census for their power and distribution transformers in Sumatra, Java, Bali and eastern part of Indonesia from 2013 to 2015. In 2019 to 2020, the PLN conducted their own inventory (independent inventory) to their unused transformers (waste transformers).

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[1] Law No. 19/2009 on the Ratification of the Stockholm Convention on Persistent Organic Pollutant, Elucidation

[2] Stockholm Convention Annex A Part II (e). The threshold limit for the phasing out of PCBs is > 50 ppm. In the meantime, in Indonesia, based on the MoEF Regulation No. P. 29/2020 is PCBs content ≥ 50 ppm.

The Indonesian Minister of Environment and Forestry (MoEF) has issued a regulation No. P.29/MENLHK/SETJEN/PLB.3/12/2020 (MoEF Regulation No. P29/2020) on the Management of Polychlorinated Biphenyls.

Article (2) of the regulation requires the business owners to manage PCBs, especially the PCBs with concentration ≥ 50 ppm in the equipment (transformers and capacitors) and dielectric oils.

The identification of PCBs in the equipment (transformers and capacitors) and dielectric oils should be done by 31 December 2022.[3] The unidentified equipment and dielectric oil beyond 31 December 2022 should be treated as B3 waste in accordance with the prevailing regulations[4]. The regulations shall refer to the MoEF Regulation No. P.29/2020 and other relevant regulations such as Government Regulation No. 22/2021 on Environmental Protection and Management.

The deadline for the phasing out of PCBs is by 31 December 2028[5]. Beyond this date, the management of PCBs shall be based on the prevailing law and regulations[6], including provisions of the MoEF Regulation No. P.29/2021.

1.1. The Scope of National PCBs Management Plan

This document is intended to provide a general plan regarding the management of equipment and dielectric oils containing PCBs ≥ 50 ppm based on the inventories phase 1 and phase 2. The National PCBs Management Plan is supplemented with two documents namely Standard Operational Procedure for the Management of Equipment and Material Containing PCBs that can be referred to handle PCBs contaminated equipment and PCBs Code of Practice which is an output from NIP 2008 and 2014.

The management of PCBs based on the MoEF Regulation No. P. 29/2020 Article (1) 5 covers reduction, storage, and treatment. Therefore, it is not enough to understand PCBs management solely based on this MoEF regulation. Regulations and other relevant documents covering aspects of transportation, B3 symbols and labelling, B3 waste symbols and labelling, B3 waste storage, occupational health and safety, must also be a reference. The National PCBs Management Plan and the two annexes are expected to cover the management of the entire PCBs life cycle, safety countermeasures, policy and technology transfer and etcetera.

[3] MoEF Regulation No. P.29/2020, Article 23 (1)
[4] MoEF Regulation No. P.29/2020, Article 23 (2)
[5] MoEF Regulation No. P.29/2020, Article 24 (1)
[6] PMoEF Regulation No. P.29/2020, Article 24 (2)

1.2. Focus Group Discussions (FGD)

In order to formulate the PCB Management Plan, a series of focus group discussions (FGD) were organized to gather information and aspirations from stakeholders and to integrate their inputs into the National PCB Management Plan. The summary of the FDGs is as follows:

1) FGD with local environmental agencies (BLHD) on 18 August 2020. This activity aimed to identify challenges and capacities of local governments (particularly local environmental agencies) pertaining to the phasing out and elimination of PCB by 2028.
2) FGD with industrial sectors on 24 August 2020. This activity aimed to find out perspectives of industry regarding the government's policy on the management of B3 and B3 waste, and to identify challenges and capacity of the companies with regards to the phasing out of PCBs.
3) FGD with service companies such as transporters, B3 waste treatment companies, and laboratories on 20 October 2020. This activity aimed to identify cost components, laboratory analysis methods, transportation of B3 and B3 waste, installation and investment that are needed for the phasing out and elimination of PCBs.
4) FGD with PLN on 18 November 2020. This activity aimed to identify challenges and capacity of PLN towards the phasing out and elimination of PCBs by 2028.

1.3. Interviews

Interviews were conducted in order to obtain more detailed information. For example, interviews with officials with MoEF[7] to draft a concept note on the national information system for PCBs.

1.4. National Objectives

Strategies of the National PCBs Management Plan will basic objectives as follows[8]:

- Phasing out of PCBs. The strategy for the phasing out of PCBs is by reducing and eventually eliminating the use of PCBs and/or PCBs contaminated equipment and treating them. Indonesia is intended to follow the deadline stipulated by the Stockholm Convention. Based on MoEF Regulation No. P. 29/2020 on the Management of PCBs, equipment (transformers and capacitors) is considered as contaminated when the concentration of PCBs ≥ 50 ppm in the dielectric oil. The environmentally sound management (ESM) of PCBs is conducted throughout the lifetime of the equipment (transformer)

[7] 11 September 2020, 7 October 2020, 12 December 2020

[8] Preparation of a National Environmentally Sound Management Plan for PCBs and PCBs-Contaminated Equipment, Training Manual, Secretariat of the Basel Convention, http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/pcbManualE.pdf

that is containing PCBs ≥ 50 ppm. The ESM of PCBs includes several stages such as policy formulation, inventory, storage, domestic transportation, processing and disposal. Precautions such as retrofilling and maintaining oil in the transformer that is contaminated with PCBs will be elaborated in this document. The ESM of PCBs in this context refers to the concept that is developed under Basel Convention.

- Integrating the PCB management plan into the national environment management program. The decision regarding the management of PCBs will take into account the objectives of environmental management in Indonesia and related regulations such as MoEF regulation on PCBs, management of B3, B3 waste management, environmental law and international conventions that have been ratified by GoI. The industry sector is advised to provide its PCB Management Plan and report the status of PCBs and/or equipment contaminated with PCBs that they possess to the MoEF. The MoEF is responsible to monitor and implement the mandate of Stockholm Convention, as well as to manage the national information system for PCBs.

CHAPTER 2

Regulatory Framework Regarding Environmentally Sound Management (ESM) of PCBs

2. Regulatory Framework on the ESM PCBs

Provisions regarding ESM PCBs at the international level refer to the Stockholm and Basel Conventions as well as relevant guidelines issued by the secretariat of these conventions. At the national level, provisions regarding the management of PCBs refer to the prevailing laws and regulations in Indonesia, as well as guidelines or other documents issued by the GoI.

2.1. Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutant was adopted in 2001 and it entered into force for the signatories in 2004. This convention aims to protect humans and the environment from organic pollutants by controlling and ultimately eliminating the production, use, emission, import and export of persistent organic pollutants of which PCBs are one of them.[9]

As a party of the Stockholm Convention, Indonesia is obligated to meet the deadlines set by the convention. By 2025, the parties shall[10]:

- conduct a PCBs national inventory of PCBs and contaminated equipment;
- eliminate the use of equipment containing PCBs greater than 100,000 ppm;
- eliminate the use of equipment containing PCBs greater than 500 ppm;
- eliminate the use of equipment containing PCB greater than 50 ppm;
- reduce the exposures and risks of PCBs in densely populated areas of feeding or feeding areas;
- prohibit the export and import PCBs, except for environmentally sound management purposes;
- prohibit recovery for reuse purposes on other equipment with *Polychlorinated Biphenyls* greater than 50 ppm except for maintenance and service operations.

[9]Purpose (or in the Vienna Convention on the Law of Treaties referred to as an "Object and Purpose") can be seen in the Preamble and Article 1 of the Stockholm Convention on Persistent Organic Pollutants (POPs) 2256 UNTS 119; 40 ILM 532 (2001).

[10] Stockholm Convention on Persistent Organic Pollutants (POPs) 2256 UNTS 119; 40 ILM 532 (2001). Annex A

As soon as possible but no later than 2028, the parties to the convention must make serious efforts towards the management of liquid waste containing PCBs and equipment contaminated with PCBs with concentration greater than 50 ppm, based on paragraph 1 Article 6 Convention Stockholm[11].

The Stockholm Convention does not specifically define the meaning of environmentally sound management of PCBs. However, the Basel Convention[12] provides definition of environmentally sound management of hazardous waste (or other waste), namely **"the implementation of practical measures to ensure that hazardous wastes are managed in a way that will protect human health or the environment"[13].** Indonesia has ratified the Basel Convention[14] and adopted the principles of the convention, particularly related to B3 waste management.

The Stockholm Convention further regulates strategies for managing persistent organic pollutants (which include PCBs). Some of the provisions of the Stockholm Convention that are relevant in the PCBs management are as follows:

Table 1. Provisions of Stockholm Convention

Stockholm Convention	Explanations
Article 6 (d) ii *"Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option....."*	POPs waste must be destroyed in a way that the content of POPs will be completely destroyed or changed permanently (into non-POPs). In this context, it is very important if the destruction method/technology used eliminates harmful properties of POPs compounds, does not produce by-products that are also in the form of POPs or produce emissions in the form of POPs (unintentional release of POPs). In addition, related to the PCBs, the waste management must comply with this provision and must be managed specifically.
Article 6 (d) iii *"Not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants"*	The Stockholm Convention does not allow the destruction of POPs through recovery, recycling, reclamation, direct use or alternative use of POPs.

[11]Stockholm Convention Annex A, Part II (e).

[12] Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal

[13]Basel Convention Article 2 number 8 *"Environmentally sound management of hazardous wastes or other wastes means taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".*

[14] Indonesia ratified Basel Convention and its amendment through Presidential Decree No. 61/ 1993 and Presidential Regulation No. 47/2005.

Annex C Part V.A (d) *"Priority should be given to the consideration of approaches to prevent the formation and release of the chemicals listed in Part I (PCDD/PCDF, HBC, PCB): Replacement of feed materials which are persistent organic pollutants of where there is a direct link between the materials and releases of persistent organic pollutants from the source".*	In terms of unintentional production of POPs, the Stockholm Convention prioritizes approaches (use of technology) that can prevent the formation and release of PCDD/PCDF, HBC, PCBs as listed in list I Annex C. This is done by replacing feed materials in the form of POPs or replacing materials where (later) there will be a direct relationship between the material and the release of POPs from the source.
Annex C, Part V B (b) *"When considering proposals to construct new facilities or significantly modify existing facilities using processes that release chemicals listed in this Annex,* priority consideration *should be given to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of such chemicals."*	In terms of the construction of POPs destruction facilities, the Stockholm Convention requires member states to give priority to techniques and processes that can prevent the formation and release of POPs to the environment.

The Stockholm Convention requires member states to apply the *best available techniques* (BAT) and the best environmental practices (BEP) in the case of POPs destruction. The Convention defines BAT and BEP as follows:

> Article 5 (f) i *"Best available techniques means the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for release limitations designed to prevent and, where that is not practicable, generally to reduce releases of chemicals listed in Part I of Annex C and their impact on the environment as a whole".*

Based on this article, the parties are obligated to use the most effective and most advanced technology in preventing the release of chemicals (which are listed in Part I of Annex C) and preventing the impact (release of these chemicals) on the environment thoroughly.

> Article 5 f (v) *"Best environmental practices means the application of the most appropriate combination of environmental control measures and strategies".*

Based on the Stockholm Convention and Basel Convention, environmentally sound management of PCBs is **the implementation of practical measures that refer to best available techniques and/or best environmental practices to**

ensure that the management of Polychlorinated Biphenyls materials and waste does not harm human health and the environment.

2.2. Law No. 19/2009

Law No. 19/2009 on ratification of the Stockholm Convention on Persistent Organic Pollutants.

2.3. Government Regulation No. 74/2001

Government Regulation No. 74/2001 on the Hazardous and Toxic Substance (B3) categorizes PCBs as B3 that are prohibited to be used, produced, distributed and imported. It can be interpreted that equipment contaminated with PCBs is also prohibited.

2.4. Government Regulation No. 22/2021

Government Regulation No. 22/2021 on the Environmental Protection and Management was issued in 2021 and it replaced Government Regulation No. 101/2014 on the Management of B3 Waste.

Based on the Government Regulation No. 22/2021, waste-containing PCBs is categorized as hazardous and toxic waste (*limbah B3*). In the Government Regulation Appendix IX I, PCBs are listed in Table 1 (B3 waste from non-specific sources), with code A101d with Category 1 Hazard Classification.

Government Regulation No. 22/2021 Article 343 (1) stipulates several options for the treatment of B3 waste namely thermal, stabilization, and solidification, as well as methods in accordance with the development of science and technology. In terms of thermal method, Article 345 (5) states that PCBs waste treatment must meet the efficiency standards for the destruction and removal of *Polychlorinated Biphenyls* compounds with at least 99.9999%.

In terms of non-thermal methods, if stabilization and solidification are deemed inappropriate to treat waste containing PCBs, Article 343 letter c suggests other methods in accordance with the development of science and technology. In this regard, the methods of decontamination and dechlorination stipulated by Article 17 (1) b and Article 19 MoEF Regulation No. P.29/2020 on PCBs need to be applied.

MoEF Regulation PP No. 22/2021 Article 276 (1) states that everyone generated B3 waste is obligated to manage his or her B3 waste. In addition, Government Regulation No. 22/2021 states that B3 waste based on its source consists of B3 waste from specific source, B3 waste from expired B3, spilled B3, B3 that does not meet product specification and to be disposed of, used B3

packaging and B3 waste from specific sources[15]. Law No. 32/2009 on Environmental Protection Management states that expired B3 must be managed as B3 waste[16]. Government Regulation No. 74/2001 states that B3 waste originating from expired B3, B3 that does not meet product specification and to be disposed of, and used packaging must be managed based on provisions regarding B3 waste management[17].

In this regards, PCBs that have been banned from use must be managed in accordance with the provisions of B3 waste management and comply with the provisions for the treatment of PCBs (e.g. 99.9999% destruction efficiency standard, the application of decontamination and dechlorination methods). The Government Regulation No. 22/2021 and MoEF Regulation No. P.29/2020 pertaining to B3 waste PCBs management should be implemented holistically.

2.5. Ministry of Environment and Forestry (MoEF) Regulation No. P.29/2020

In the preamble of MoEF Regulation No. P.29/2020, it is stated that management efforts are conducted to phase out PCBs no later than 2028 in accordance with the provisions of the Stockholm Convention.[18] This can be done gradually by eliminating PCBs ≥ 50 ppm in the equipment (transformers, capacitor) and in the dielectric oil.

Based on the regulation, identification of PCBs ≥ 50 ppm in the equipment (transformer, capacitor) should be done by 31 December 2022.[19] Identification of PCBs is regulated based on Article 5 to 12.

The deadline for the phasing out of PCBs will be 31 December 2028[20]. After 31 December 2028, PCBs should be managed[21]. In this case, what is meant by "managed" means that PCBs must be properly treated and removed according to the guidelines of the Stockholm Convention, particularly Article 6. In the event that the dielectric oil in transformers and capacitors contains PCBs lower than 50 ppm, the equipment and dielectric oil are excluded from the PCBs management.

Owners of business and/or activities that are required to have an environmental impact assessment (IEA) or environment management unit (UKL)/environment monitoring unit (UPL) that utilize PCBs or generate PCB waste are required to manage PCBs.[22] PCBs management based on Article (1) paragraph 5 and Article (2) paragraph 2 includes reduction, storage and/or treatment. In this regard, the scope of the MoEF regulation in PCB Management is limited. Therefore, in order to understand the comprehensive management of PCBs in

[15] Government Regulation No. 22/2021 Article 276 (3) a, b, and c.
[16] Law No. 32/2009 Article 59
[17] Government Regulation No. 74/2001 Article 20
[18] MoEF Regulation No. P.29/2020, Consideration (b)
[19] MoEF Regulation No. P.29/2020, Article 23 (1)
[20] MoEF Regulation No. P.29/2020, Article 24 (1)
[21] MoEF Regulation No. P.29/2020, Article 24 (2)
[22] MoEF Regulation No. P.29/2020, Article 2 (1)

Indonesia, it is necessary to refer to other relevant regulations such as regulations regarding the transportation of B3 waste, guidelines for retrofilling procedures and others.

The owners of business and/or activities have the obligation to report to the MoEF in relation to: a) PCBs storage and/or PCBs treatment[23], b) PCBs management on transformers that are still in use[24], including retrofilling activities. Report related to the PCBs storage and/or treatment activities are submitted as part of the B3 waste management permit report[25]. Reports related to PCBs management on transformers that are still in use are submitted as part of the environmental permit report.[26] MoEF Regulation No. P. 29/2020 does not provide detailed guidance on retrofilling. Retrofilling is one of the ways to reduce the concentration of PCBs in transformers. This is further elaborated in the document namely PCBs Code of Practice (see Annex).

PCBs treatment can be done thermally and non-thermal[27]. Based on the Article 18 MoEF Regulation No. P. 29/2020, the treatment of dielectric oil containing PCBs above 10.000 ppm and porous solid materials can be done by thermal and non-thermal methods. Thermal treatment is required to meet the efficiency standards for destruction and removal of compounds with at least 99.9999%, and to have a combustion efficiency of at least 99,99%, also to have a combustion temperature of at least 850°C with a retention time of at least two seconds. Non-thermal treatment for PCBs includes decontamination and dechlorination[28].

For environmentally sound management of PCBs, companies are advised to develop a PCBs management plan at the company level. The importance of this document will be discussed further in Chapter 4 (National Action Plan).

2.6. Job Creation Law No. 11/2020

Job Creation Law No. 11/2020 amends Article 59 Law No. 32/2009 on the Environmental Protection and Management. Job creation law abolishes B3 waste management permits and integrates them with business licensing or approval from the central government or regional government.[29] Article 59 (5) Job Creation Law states “The Central Government or Regional Government is obliged to include environmental requirements that must be complied with by those who treat B3 waste. The environmental requirements include business licensing or approval from the Central Government or Regional Government”.

[23] MoEF Regulation No. P.29/2020, Article 22 (1) (2)
[24] MoEF Regulation No. P.29/2020, Article 13, 14
[25] MoEF Regulation No. P.29/2020, Article 22 (3)
[26] MoEF Regulation No. P.29/2020, Article 14 (3)
[27] MoEF Regulation No. P.29/2020, Article 17 (1)
[28] MoEF Regulation No. P.29/2020, Article 19
[29] Job Creation Law No. 11/2020, Article 59

What is meant by “approval” is not yet clear and has not been further regulated. The existing assumption (while awaiting regulation/further explanation) is that business licenses are intended for those in charge of businesses/activities whose main activities are related to the B3 waste management (B3 waste management operators), while “approval” is intended for those in charge of businesses/activities whose generate B3 waste (B3 waste generators). Business licenses are generally issued by the investment agency. At the time of writing this document, it is not yet clear which government institution is mandated to supervise the provisions of the Job Creation law.

As an implication of the Job Creation Law, it is necessary to provide further explanation regarding the concept of business licensing in the Job Creation Law and Government Regulation No. 24/2018 on Integrated Business Licensing Services (known as Government Regulation on *Online Single Submission*/OSS), as well as further explanation pertaining to legal instruments that link business licensing with ”environmental requirements” that required in the B3 waste management.

2.7. Other Related Regulations

Government Regulation No. 24/2014 (Government Regulation on Online Single Submission) as implemented by the MoEF Regulation on integrated licensing[30] combines B3 waste licensing into two namely: (i) B3 Waste Management Permit for Service Businesses (for business actors who manage B3 waste), and ii) Operational Permit B3 Waste Management for B3 Waste Generators (for business actors who generate B3 waste).

Job Creation Law fully integrates B3 waste management permits into business licensing or approval. The assumption is that the B3 waste management operational permit can be integrated with the approval while the B3 Waste Management permit can be integrated with the business licensing. The certainty regarding licensing needs to wait for further implementing provisions of the Job Creation Law.

Currently, the licensing is regulated in the MoEF Regulation No. P 29/2020 on PCBs Management still refers to the environmental and B3 waste management permits. The following are regulations that establish the basis for the PCB management in Indonesia.

Table 2 Laws/Regulations Related to the PCBs Management in Indonesia

No	Laws/Regulations	Explanation
1	Law No. 19/2009 on Ratification of the Stockholm Convention on Persistent Organic Pollutants.	The Government of Indonesia ratified the Stockholm Convention through this law.

[30] MoEF Regulation No. P.5/Menlhk/Setjen/Kum.1/1/2020 on the Amendment of MoEF Regulation No. P.22/Menlhk/Setjen/Kum.1/7/2018 on the Norm, Standard, Procedure, and Criteria of Electronic Integrated Licensing System within the MoEF.

	Law No. 32/2009 on the Environmental Protection and Management	This law is the main regulation for the environmental protection and management, including the B3 waste management.
2	Job Creation Law No. 11/2020 and its implementing regulations	The Job Creation Law and its implementing regulations amended several provisions of Law No. 32/2009 on the Environmental Protection and Management and its implementing regulations.
3	Government Regulation No. 74/ 2001 on the Management of Hazardous and Toxic Substance	This Government Regulation stipulates PCBs as a forbidden B3.
4	Government Regulation No. 22/2021 on the Environmental Protection and Management	Government Regulation No. 22/2021 Article 343 (1) stipulates several options for the B3 waste treatment, namely thermal, stabilization and solidification, as well as other methods based on the developments in science and technology. In this regard, if stabilization and solidification are deemed inappropriate to treat waste containing PCBs, Article 345 paragraph (1) letter c refers to other methods based on scientific and technological developments. In this case, the decontaminations and dechlorination methods stipulated in Article 17 (1)b and Article 19 MoEF Regulation No. P.29/2020 needs to be applied.
5	Government Regulation No. 5/2021 on the Implementation of Risk-Based Business Licensing (Environmental and Forestry Sector)	This Government Regulations stipulates risk-based business licensing in the environmental and forestry sector.
6	MoEF Regulation No. P. 29/2020 on the Management of PCBs	This regulation stipulates provision regarding the management of PCBs.
7	MoEF Regulation No. P.12/MENLHK/Setjen/PLB.3/5/2020 on the B3 Waste Storage	What needs to be added in this regulation is that B3 waste containing PCBs should not be stored in one container with other B3 waste to avoid the risk of cross contamination.
8	MoEF Regulation No. P.4/2020 on the B3 Waste Transportation	This regulation stipulates provisions regarding the transportation of B3 waste.
9	MoEF Regulation No. P.4/2021 on the List of Business/Activities That are Required to Have EIA, UKL/UPL or SPPLH	This regulation stipulates provisions for the business/activities that are required to have EIA, UKL/UPL or SPPLH.
10	MoEF Regulation No. P.6/2021 on the Procedure and Requirement of B3 Waste Management.	This regulation stipulates provisions regarding the procedure and requirement regarding B3 waste management.

CHAPTER 3

PCBs INVENTORY AND NATIONAL DATA EXTRAPOLATION

3. Inventory and Data Extrapolation

As described in Chapter II, identification of PCBs ≥ 50 ppm in equipment (transformers, capacitors) and dielectric oil is mandatory. Identification is the first step prior to an inventory.

The PCBs inventory is intended to identify, quantify PCBs/concentrations and to maintain records of PCBs contained in dielectric oil, equipment and other materials[31]. Managing oil records is defined as updating and following up with appropriate actions such as retrofilling, making records as the basis for reports to the government, B3 waste management and others. The national PCBs inventory is very important as it provides basic information about PCBs and/or equipment containing PCBs in Indonesian territory based on samples taken and tested.

In Indonesia, as the types of industries that had participated in inventory activities vary, a uniform standard is needed for classification. Therefore, the classification for the types of industry is based on the Indonesian economic census 2015 - 2016 (Inventory Phase 1) and census 2019 - 2020 (Inventory Phase 2).

Extrapolation of national data on transformers in Indonesia is an estimation of data on the distribution of transformers in Indonesia and the potential for PCBs contamination. Data extrapolation helps the government to estimate the potential for PCBs contamination in equipment and its distribution in Indonesia. This can also help the government to plan for the phasing out of PCBs.

3.1. PCBs National Inventory

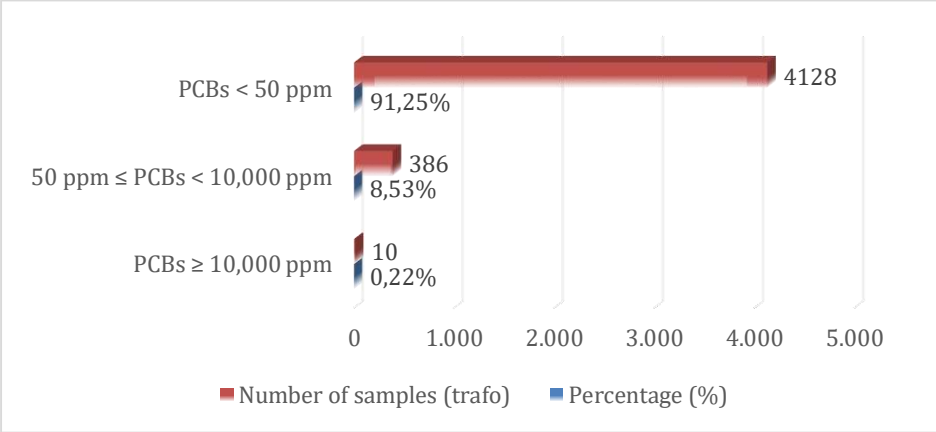
This sub-chapter describes the profile of PCBs contamination in Indonesia based on the national inventory (PCBs Inventory Phase 1 and Phase 2). The samples of transformers taken for the inventories were those that were operating (transformers with online status). The samples for PCBs Inventory Phase 1 were 3,015 transformers and Inventory Phase 2 were 1,509 transformers (total samples are 4,524 transformers).

The profile is categorized by region (province), type of industry, manufacture year, and types of equipment.

From the Chart 1 below, it can be found that overall, the inventory results showed that 396 samples (8.75%) were contaminated and 4,128 samples (91.25%) contained PCBs less than 50 ppm (not contaminated with PCBs).

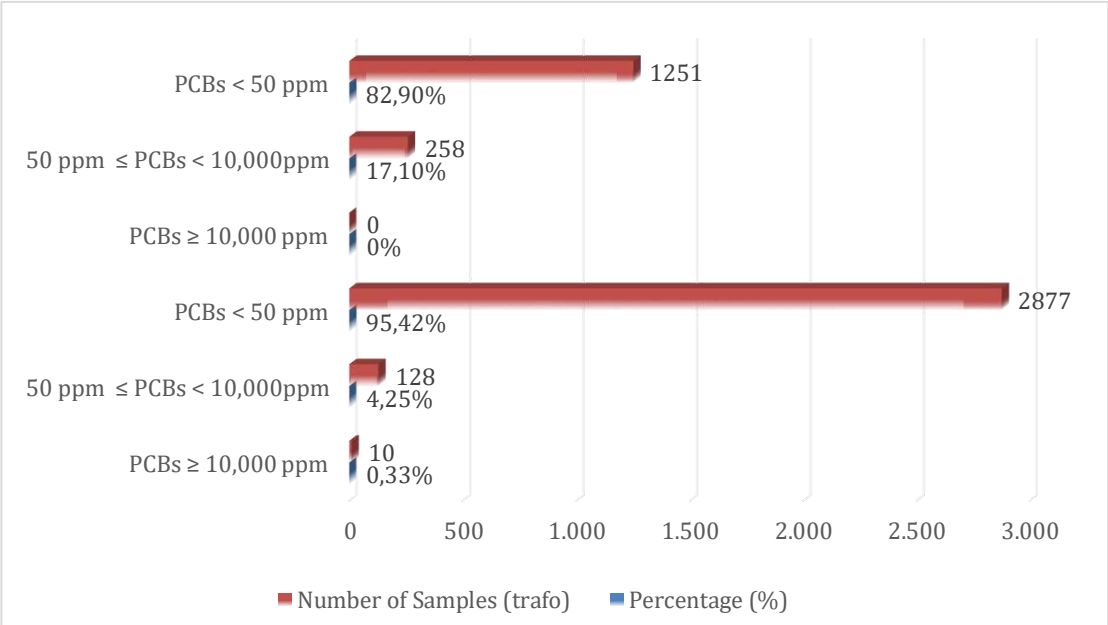
[31] Inventories of PCBs an Expert's Point of View, Urs K. Wagner, https://www.informea.org/sites/default/files/imported-documents/UNEP-POPS-PAWA-CASES-InventoriesOfPCBSExpertPointOfView.En.pdf

Chart 1 PCBs Contamination Status Based on National Inventory



Meanwhile, 4.58% of samples from Inventory Phase 1 were contaminated with PCBs, while 17.1% of samples from the Inventory Phase 2 were identified as contaminated with PCBs (≥ 50 ppm)[32]. This can be found in Chart 2 below.

Chart 2 PCBs Contamination Status per Inventory Phase Based on National Inventory

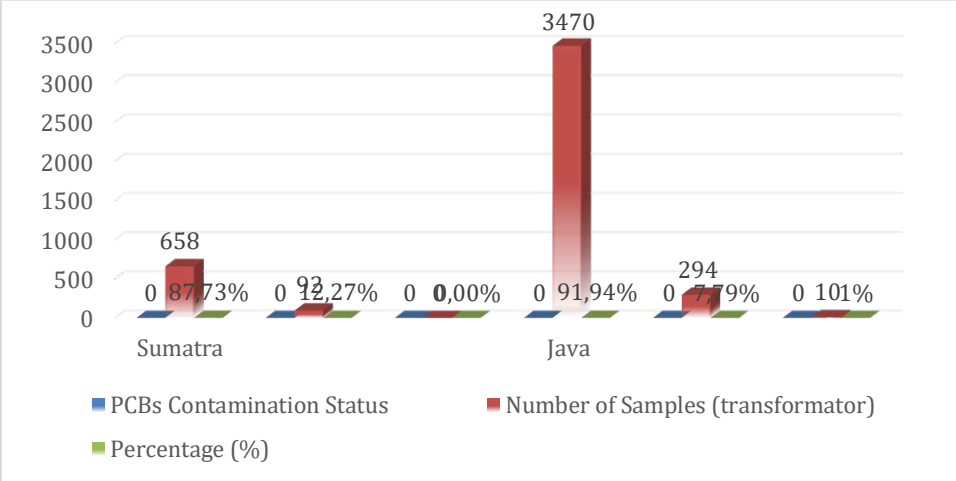


In addition, based on regional (provincial) samples, 12.27% of samples from Sumatra Region were contaminated, while 8.45% samples from Java were contaminated.[33] This profile can be found in Chart 3 below. The results of this

[32] Statistic Report 2nd Phase of Extended PCB Inventory in Indonesia 2020
[33] Ibid

inventory do not include PLN's transformers (excluding data from the PLN census).

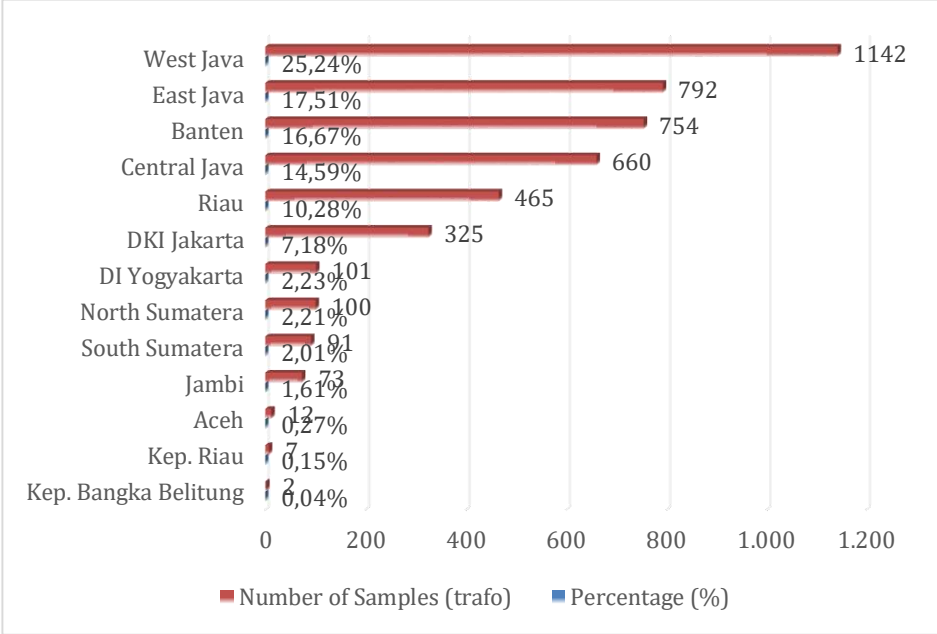
Chart 3 PCBs Contamination Status per Region Based on National Inventory



3.1.1. PCBs Contamination Status Based on Province

Samples were taken in 13 provinces located on the islands of Java and Sumatra, as shown in Chart 4 below. Provinces with the highest number of samples taken were West Java (1,142 samples or 25.24%) followed by East Java (792 samples or 17.51%), Banten (754 samples or 16.67%), Central Java (660 samples or 14.59%), and Riau (465 samples or 10.28%).

Chart 4 Sample Proportion Per Province Based on National Inventory



Provinces with the highest number of transformers contaminated with PCBs (50 ppm ≤ PCBs < 10.000 ppm) were Banten (148 samples or 16.67%), Riau (87 samples or 10.28%), West Java (54 samples or 25.24%), East Java (51 samples or 17.51%), and DKI Jakarta (40 samples or 7.18%).

In terms of contamination, Banten (19.63%), Riau (18.71%) and DKI Jakarta (12.31%) were three provinces with the highest proportion of PCBs contaminated samples. While the percentage of samples contaminated with PCBs in Aceh, Kep. Bangka Belitung and Kep. Riau Provinces was 0%. However, the number of samples was relatively small in these provinces, therefore it needs to be considered. Further information can be seen in the Chart 5 and Chart 6 below.

Chart 5 PCBs Contamination Status per Province Based on National Inventory

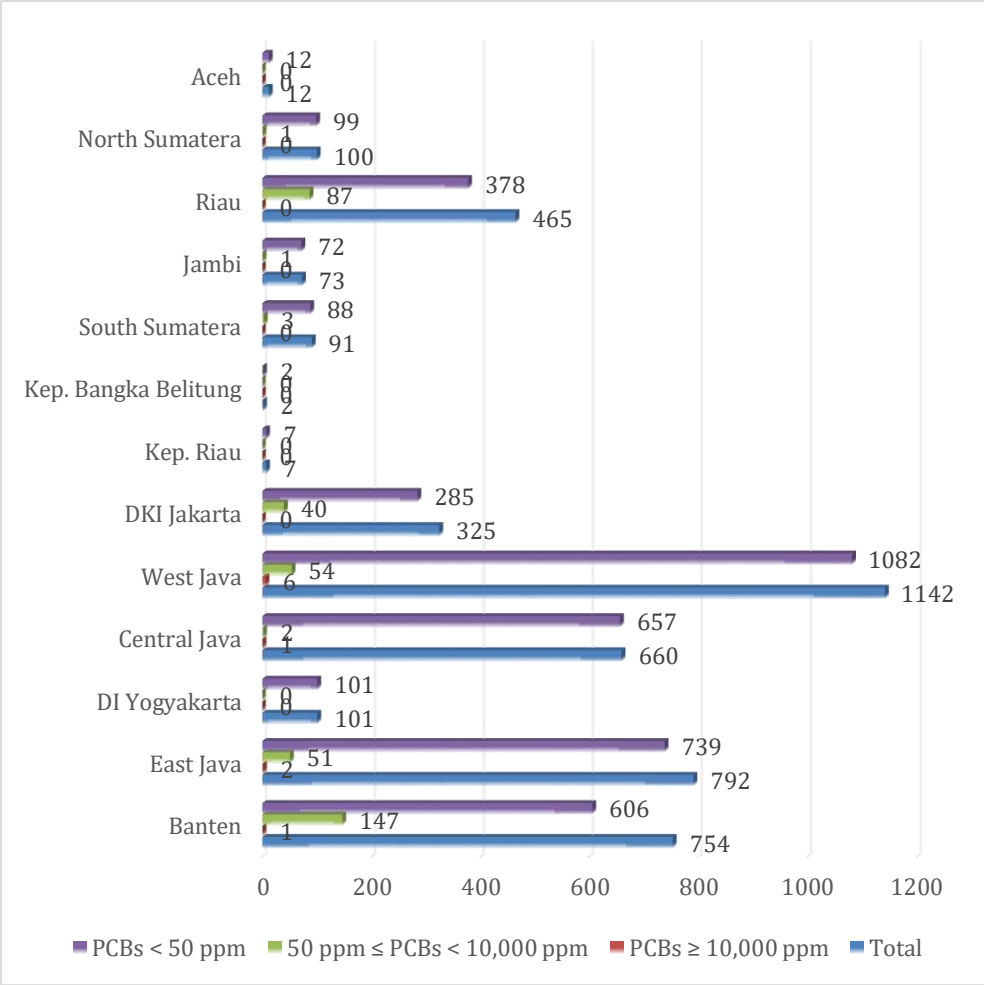
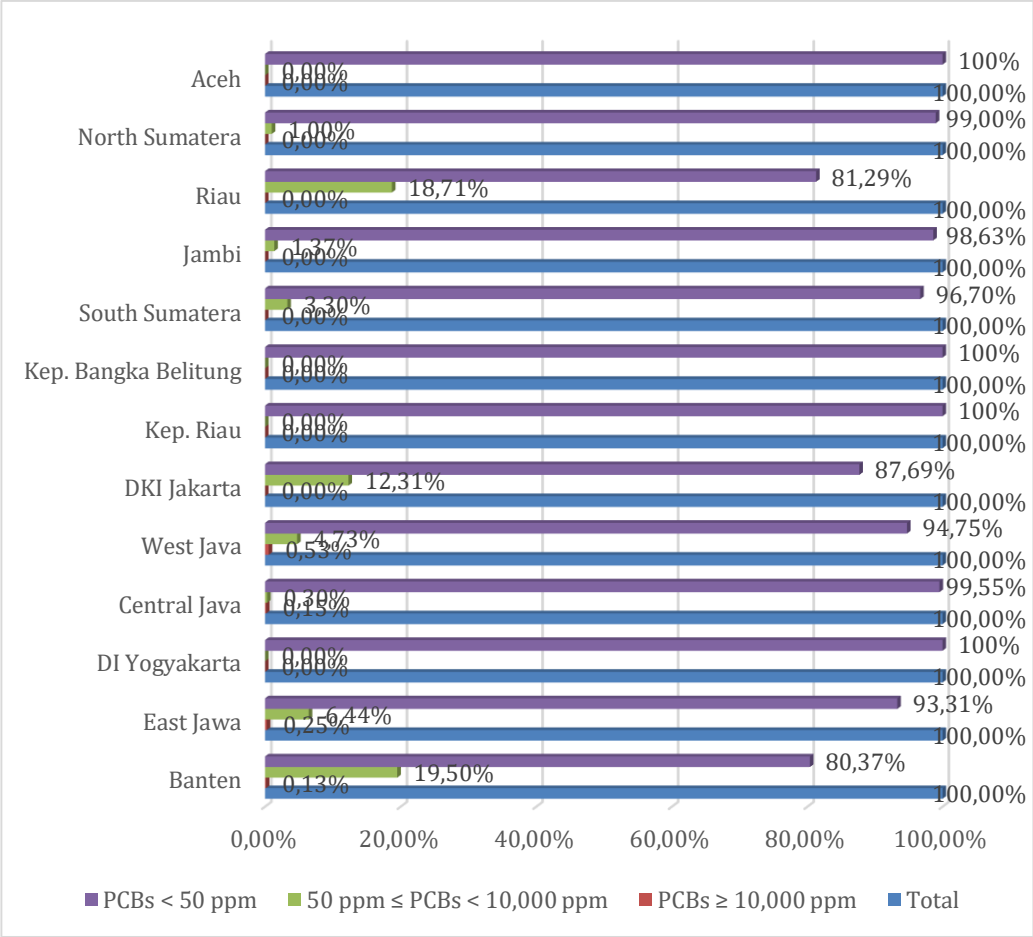


Chart 6 PCBs Contamination per Province Based on National Inventory



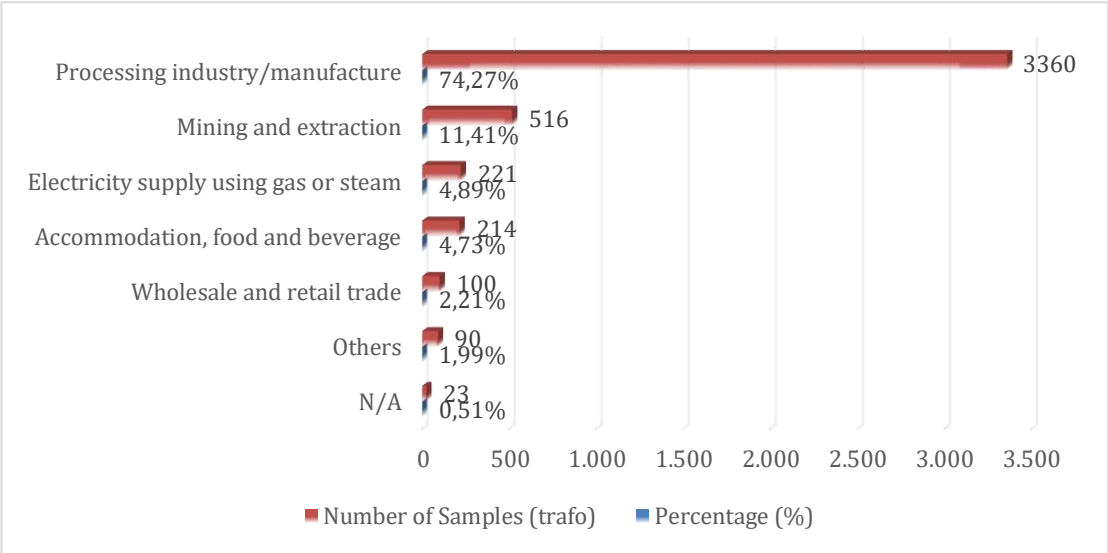
3.1.2. PCBs Contamination Status Based on Types of Industry

The types of industry from the national inventory (Inventory Phase 1 and Phase 2) covers:

a) Processing industry/manufacture;
b) Mining and extraction;
c) Electricity supply using gas or steam;
d) Accommodation, food and beverage;
e) Wholesale and retail trade;
f) Others;
g) Not Available/NA

The majority of samples were from the processing industry/manufacture (3,360 samples or 74.27%), followed by the mining and quarrying industries with 516 samples (11.41%). Further information can be seen in the Chart 7 below.

Chart 7 Sample Proportion Per Type of Industry Based on National Inventory



The processing industry also had the highest proportion of samples contaminated with PCBs (10%). This is followed by the mining and quarrying industry (6.59%) and accommodation and beverage industry (5.61%). More detailed information can be found in the Chart 8 and 9 below.

Chart 8 PCBs Contamination Status per Type of Industry Based on National Inventory

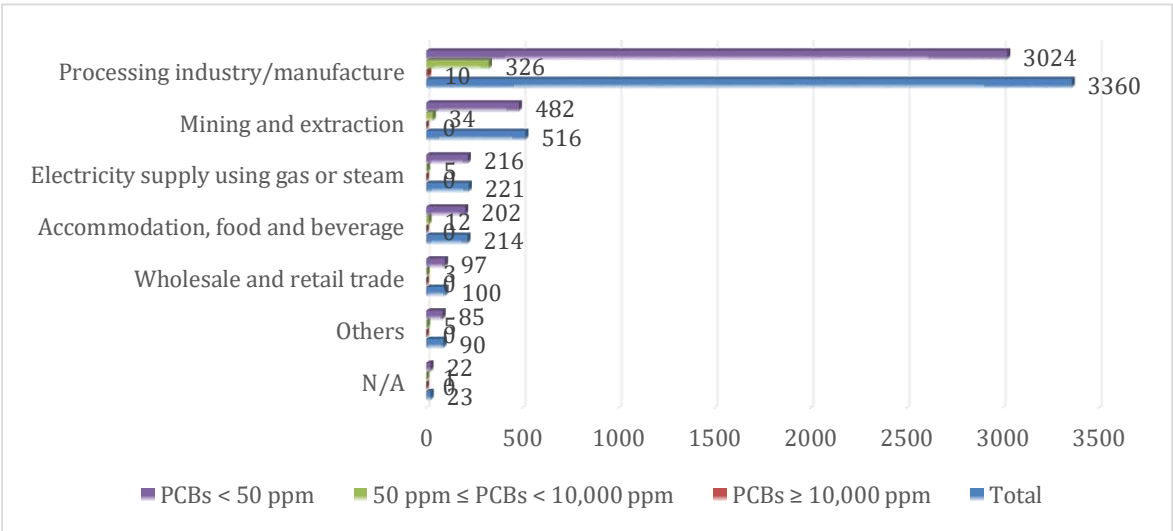
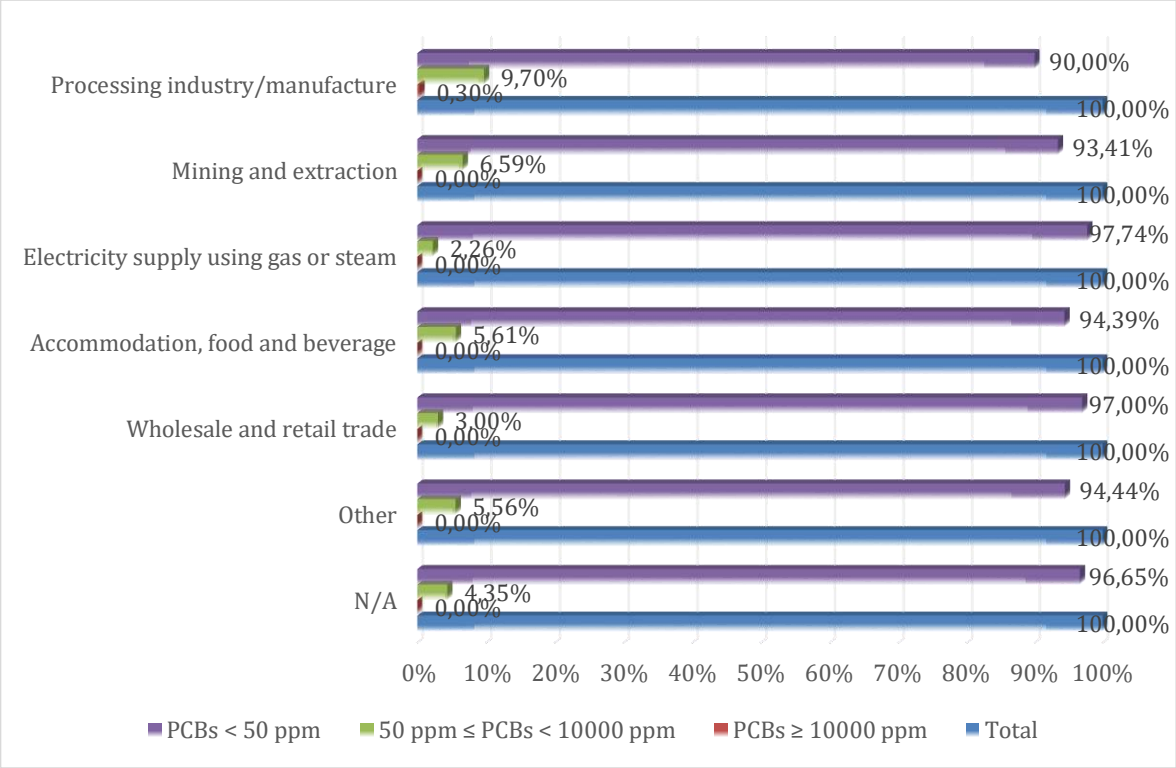


Chart 9 PCBs Contamination Status Proportion per Type of Industry Based on National Inventory



3.1.3. PCBs Contamination Status Based on the Transformers Manufacture Year

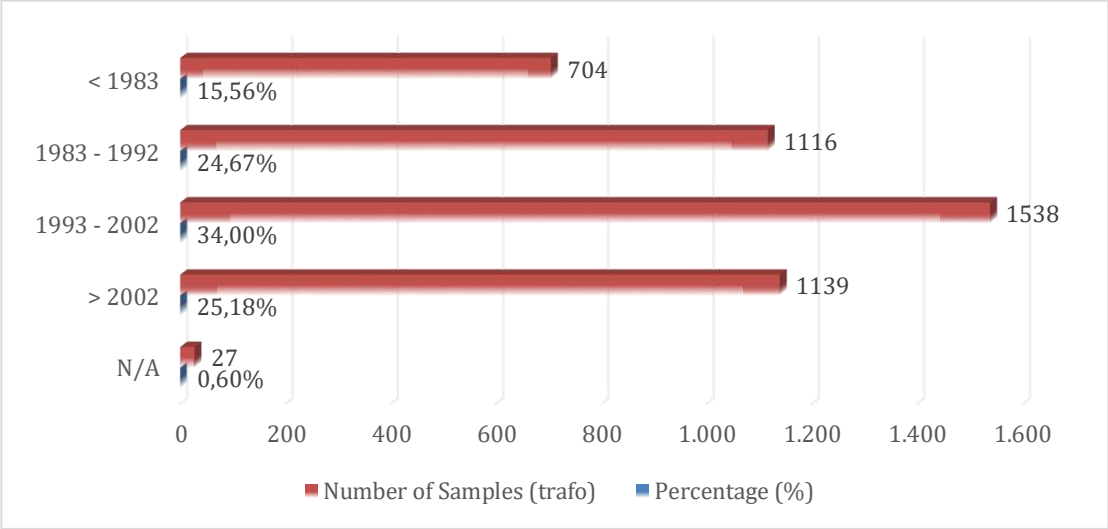
The manufactured years of the transformers based on the national inventory were:

a) < 1983
b) 1983-1992
c) 1993- 2002
d) Not Available/NA

Of the total samples (4,524 samples), transformers containing PCBs with concentration below 50 ppm (PCB <50 ppm) were 4,128 samples.

Based on Chart 10 below, it is known that the most samples taken were transformers manufactured in 1993-2002 (1,538 samples or 34%). The proportion of samples manufactured after 2002 and in 1983-1992 was almost the same, namely 25.18% and 24.67%. The sample of transformers manufactured prior to 1983 was the least number of samples being taken, which was 15.56%. In general, it can be understood that certain types of transformers, especially the old one, were less populated than the newly manufactured transformers (new transformers).

Chart 10 Sample Proportion per Manufacture Year Based on National Inventory



Transformers manufactured prior to 1983 had the highest proportion of samples contaminated with PCBs (18.46%). Transformers manufactured between 1993-2002 and 1983-1993 had almost the same proportion of samples contaminated with PCBs, namely 9.1% and 8.15% respectively. Category of transformers manufactured after 2002 had the least proportion of samples contaminated with PCBs (2.81%). Chart 11 and Chart 12 below provide more detailed information.

Chart 11 PCBs Contamination Status Per Manufacture Year Based on National Inventory

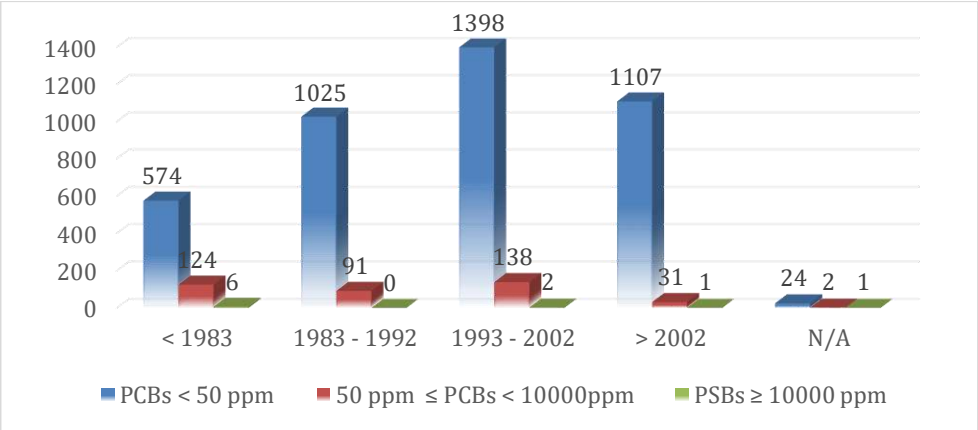
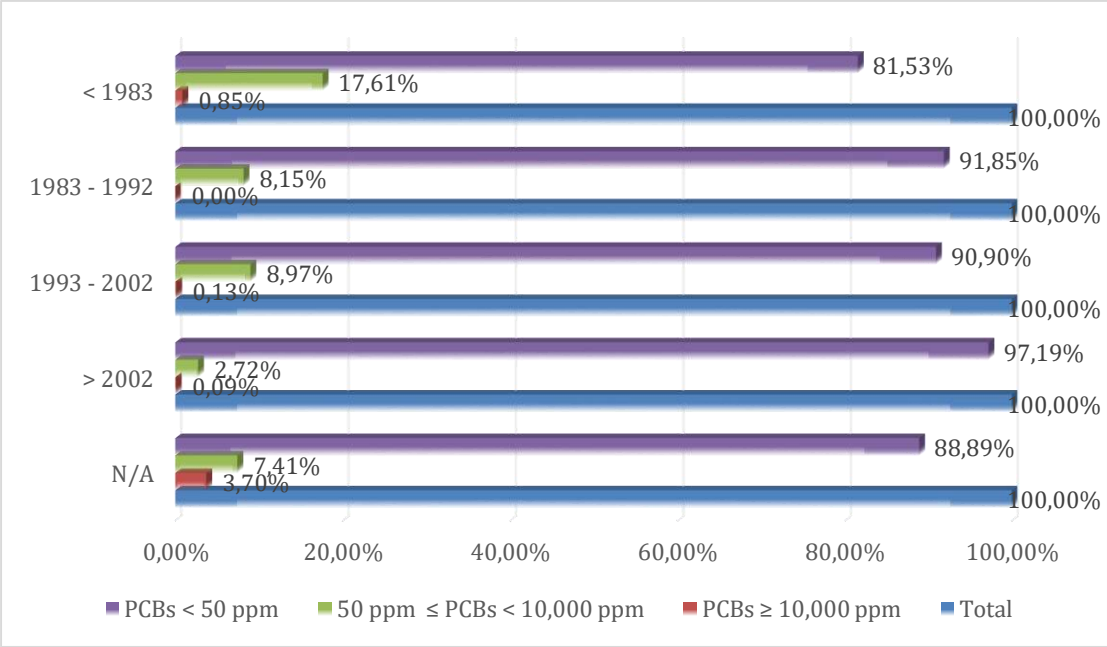


Chart 12 PCBs Contamination Status Proportion per Manufacture Year Based on National Inventory



MoEF Regulation No.P.29/2021 on the Management of PCBs states that the sources of PCBs are: transformers that manufactured prior to 1997, the wet type of transformers, transformers which has power of at least 100 kVA, and the transformer that has an outlet and/or transformer which uses the type of dielectric oil as listed in the Attachment I of the MoEF Regulation.[34] In this case, transformers manufactured after 1997 can still be contaminated with PCBs if they have been maintained. Cross contamination can occur in the maintenance process if the equipment used in this process is contaminated with PCBs[35].

3.1.4. PCBs Contamination Status Based on Types of Equipment

The types of the sample of equipment (transformers) in the national inventory were:

a) Distribution transformers;
b) Power transformers;
c) Others;
d) Not Available/NA.

Based on the national inventory, distribution transformers covered the majority of the samples with 94.71% (4,285 samples) of the sample proportion, while 4.84% (219 samples) were power transformers.

[34] MoEF Regulation No. P.29/2020, Article 3

[35] PCBs Elimination Network Magazine, http://chm.pops.int/portals/0/download.aspx?d=UNEP-POPS-PCBSPEN-MAG-01.En.pdf

Chart 13 Sample Proportion per Manufacture Year Based on National Inventory

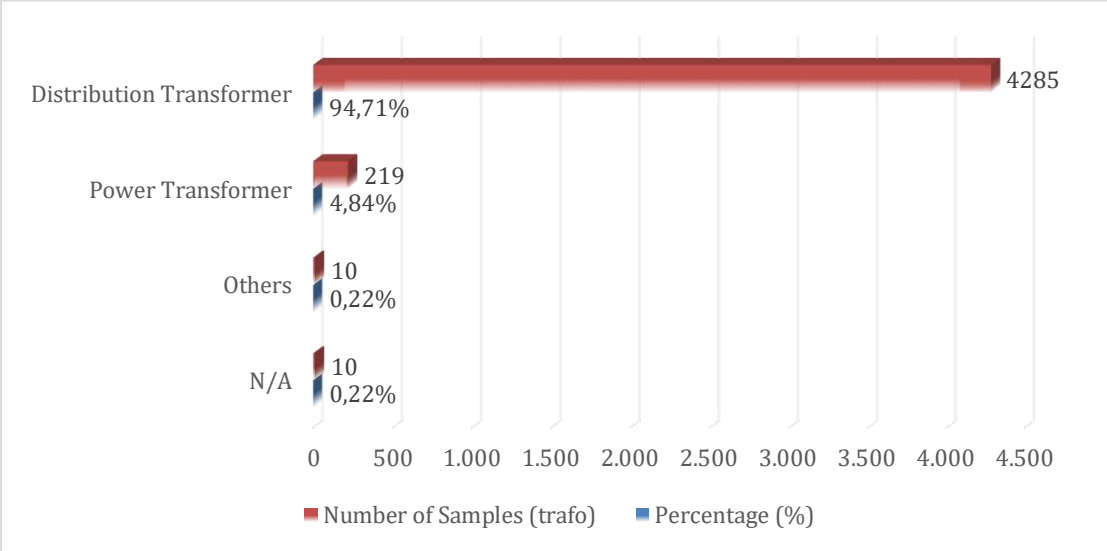


Chart 14 PCBs Contamination Status per Type of Equipment Based on National Inventory

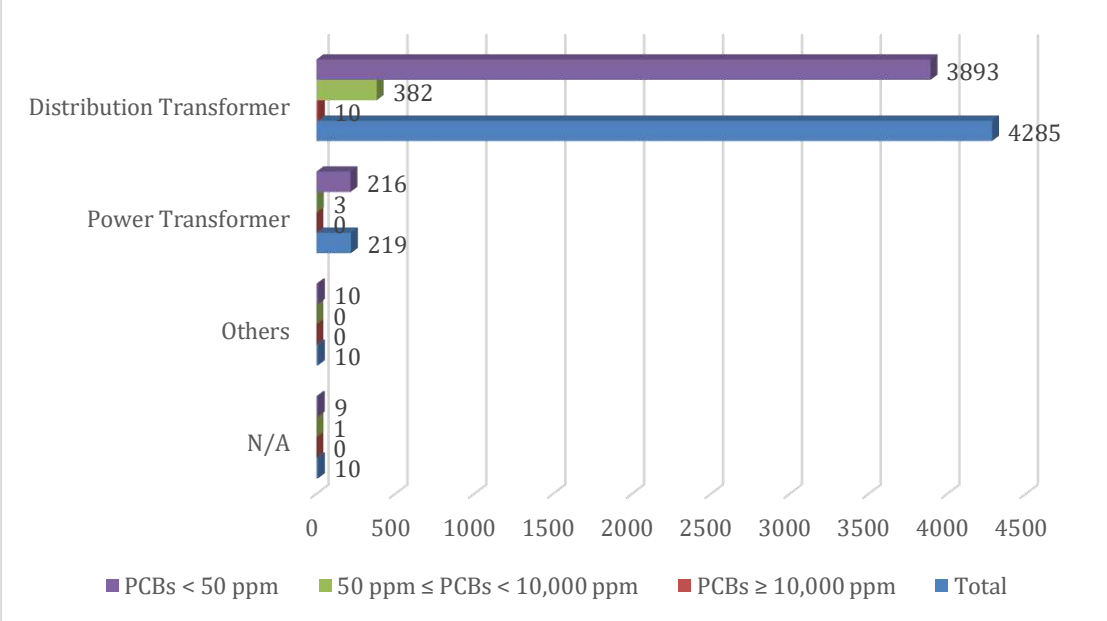
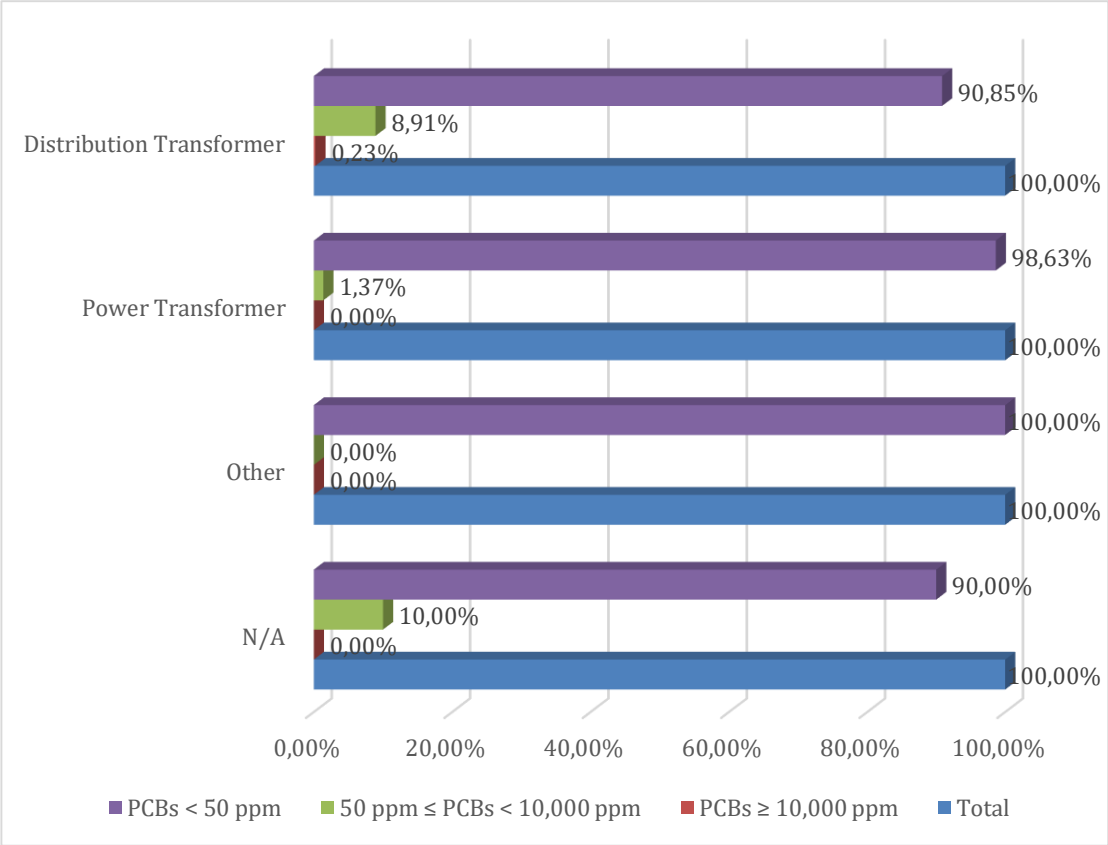


Chart 15 PCBs Contamination Status Proportion per Type of Equipment Based on National Inventory



In terms of PCBs contamination status, 1.37% of power transformer samples were contaminated, while 9.14% of distribution transformer samples were contaminated.

The distribution transformer was the most contaminated type of equipment. However, the sample of this type of transformer was also the most taken during sampling. The status of the transformer being sampled was the active transformers (still in use or online transformers). In the event the content of PCBs in the transformer below 10,000 ppm, the retrofilling option can be applied to the transformer (online transformer).

3.2. Extrapolation of National Data on Transformers in Indonesia

Data extrapolation was conducted based on the result of the national inventory (Inventory Phase 1 and Phase 2) in order to estimate:

a) the total number of transformers in Indonesia;
b) the general characteristics of transformers population in Indonesia regionally, based on types of industry, PCBs contamination status, manufacture year and power rating;

c) the volume of PCBs contaminated transformers oil in nation-scale;
d) the total weight of PCBs contaminated transformers in nation-scale.

Indonesia's economic census documents and existing industry database were used as references to classify the type of industry. The methodology for the national data extrapolation can be found in the Statistic Report 2nd Phase of Extended PCB inventory in Indonesia.

3.2.1. Estimated Transformers Population in Indonesia

Table 3 below shows the estimation of the population of transformers in Indonesia. The table also shows the estimated number of transformers per province based on the type of industry. The number is obtained by multiplying the number of companies with the average number of transformers per company.

Table 3 Estimated Population Numbers of Transformers

Province	Mining and Extraction		Processing Industry		Electricity Supply Using Gas or Steam		Wholesale and Retail Trade		Accommodation, Food and Beverage	
	Number of Company	Estimated Number of Transformers (Average 442.77 per company)	Number of Company	Estimated Number of Transformers (Average 5.58 per company)	Number of Company	Estimated Number of Transformers (Average 50.94 per company)	Number of Company	Estimated Number of Transformers (Average 3.45 per company)	Number of Company	Estimated Number of Transformers (Average 2.92 per company)
Aceh	35	15,497	75	419	29	1,477	2,456	8,473	85	248
North Sumatra	31	13,726	1,433	7,996	74	3,770	6,142	21,190	420	1,226
West Sumatra	60	26,566	204	1,138	30	1,528	3,943	13,603	179	523
Riau	70	30,994	352	1,964	46	2,343	4,294	14,814	248	724
Jambi	39	17,268	166	926	9	458	1,800	6,210	89	260
South Sumatera	85	37,635	284	1,585	31	1,579	3,165	10,919	215	628
Bengkulu	33	14,611	66	368	6	306	988	3,409	41	120
Lampung	48	21,253	466	2,600	21	1,070	3,773	13,017	100	292
Kep. Bangka Belitung	78	34,536	114	636	7	357	737	2,543	71	207
Kepulauan Riau	30	13,283	623	3,476	32	1,630	2,375	8,194	382	1,115
DKI Jakarta	58	25,681	2,903	16,199	168	8,558	21,417	73,889	4,600	13,432
West Jawa	180	79,699	9,194	51,303	182	9,271	24,448	84,346	2,285	6,672
Central Java	59	26,123	5,225	29,156	83	4,228	17,420	60,099	868	2,535

DI Yogyakarta	10	4,428	569	3,175	8	408	3,344	11,537	397	1,159
East Java	116	51,361	6,967	38,876	129	6,571	25,412	87,671	1,425	4,161
Banten	51	22,581	3,684	20,557	42	2,139	9,266	31,968	1,175	3,431
Total Sumatra-Java (83.77%)		**435,243**		**180,374**		**45,693**		**451,881**		**36,734**
Outside Sumatra - Java (16.23%)		**84,297**		**34,934**		**8,850**		**87,519**		**7,114**
Total Indonesia (100%)		**519,539**		**215,308**		**54,543**		**539,400**		**43,848**

3.2.2. General Characteristics of the Population of Transformers in Indonesia

Based on the estimated number of transformer population in Indonesia by province as in Table 3 above, an analysis of the general characteristics of the transformer was conducted. The analysis was conducted to estimate the number of the population of transformers by province based on the industry type, PCBs contamination category, manufactured year, and the power-rating category[36].

3.2.2.1. Estimated Total Transformer Population Per Province Based on Type of Industry, Contamination Category, Manufactured Year, and Power Rating Category

Based on Table 4 below, it can be seen that the estimated total number of transformers in the Java and Sumatra regions from five types of industry is 1,149,924. This amount represents 83.77% of the total transformers in Indonesia. Furthermore, the number of transformers outside Sumatra and Java regions is estimated at 222,714 and the total population of transformers in Indonesia is estimated at 1,372,638.

Table 4 Estimated Population Number of Transformers Per Province Per Industry Type

Province	Estimated Number of Transformers per Industry Type					Total Number of Transformers
	Mining and Extraction	Processing Industry	Electricity Supply Using Gas or Steam	Wholesale and Retail Trade	Accommodation, Food and Beverage	
Aceh	15,497	419	1,477	8,473	248	**26,114**
North Sumatra	13,726	7,996	3,770	21,190	1,226	**47,908**
West Sumatra	26,566	1,138	1,528	13,603	523	**43,359**
Riau	30,994	1,964	2,343	14,814	724	**50,840**
Jambi	17,268	926	458	6,210	260	**25,123**
South Sumatra	37,635	1,585	1,579	10,919	628	**52,346**
Bengkulu	14,611	368	306	3,409	120	**18,814**
Lampung	21,253	2,600	1,070	13,017	292	**38,232**
Kep. Bangka Belitung	34,536	636	357	2,543	207	**38,279**

[36] Statistic Report 2nd Phase of Extended PCB Inventory in Indonesia 2020

Kepulauan Riau	13,283	3,476	1,630	8,194	1,115	**27,699**
Total Sumatera	**225,370**	**21,109**	**14,518**	**102,372**	**5,344**	**368,712**
DKI Jakarta	25,681	16,199	8,558	73,889	13,432	**137,758**
West Java	79,699	51,303	9,271	84,346	6,672	**231,290**
Central Java	26,123	29,156	4,228	60,099	2,535	**122,141**
DI Yogyakarta	4,428	3,175	408	11,537	1,159	**20,706**
East Java	51,361	38,876	6,571	87,671	4,161	**188,641**
Banten	22,581	20,557	2,139	31,968	3,431	**80,676**
Total Java	**209,873**	**159,264**	**31,175**	**349,509**	**31,390**	**781,212**
Total Sumatra - Java (83.77%)	**435,243**	**180,374**	**45,693**	**451,881**	**36,734**	**1,149,924**
Outside Sumatra - Java (16.23%)	**84,297**	**34,934**	**8,850**	**87,519**	**7,114**	**222,714**
Total Indonesia	**519,539**	**215,308**	**54,543**	**539,400**	**43,848**	**1,372,638**

Table 5 and Table 6 below elaborated the estimation of the number of transformers per province based on the PCBs contamination category and based on the manufacturing year. Furthermore, Table 7 shows the estimation of the transformer's population based on the power rating. The calculation method can be found in the Statistic Report 2nd Phase of Extended PCBs Inventory in Indonesia, 2020.

Table 5 Estimated Population Number of Transformers per Province per PCBs Contamination Category

Province	*Estimated Total Number of Transformers*	*Contamination Status*			*Number of Transformers per Contamination Category*		
		PCBs < 50 ppm	*50 ppm ≤ PCBs < 10,000 ppm*	*PCBs ≥ 10,000 ppm*	*PCBs < 50 ppm*	*50 ppm ≤ PCBs < 10,000 ppm*	*PCBs ≥ 10,000 ppm*
Aceh	*26,114*	*91.25%*	*8.53%*	*0.22%*	*23,828*	*2,228*	*58*
North Sumatra	*47,908*	*91.25%*	*8.53%*	*0.22%*	*43,714*	*4,088*	*106*
West Sumatra	*43,359*	*91.25%*	*8.53%*	*0.22%*	*39,563*	*3,699*	*96*
Riau	*50,840*	*91.25%*	*8.53%*	*0.22%*	*46,390*	*4,338*	*112*
Jambi	*25,123*	*91.25%*	*8.53%*	*0.22%*	*22,924*	*2,144*	*56*
South Sumatra	*52,346*	*91.25%*	*8.53%*	*0.22%*	*47,764*	*4,466*	*116*
Bengkulu	*18,814*	*91.25%*	*8.53%*	*0.22%*	*17,167*	*1,605*	*42*
Lampung	*38,232*	*91.25%*	*8.53%*	*0.22%*	*34,885*	*3,262*	*85*
Kep. Bangka Belitung	*38,279*	*91.25%*	*8.53%*	*0.22%*	*34,928*	*3,266*	*85*
Kep. Riau	*27,699*	*91.25%*	*8.53%*	*0.22%*	*25,274*	*2,363*	*61*
Total Sumatra	***368,712***	*91.25%*	*8.53%*	*0.22%*	***336,438***	***31,460***	***815***
DKI Jakarta	*137,758*	*91.25%*	*8.53%*	*0.22%*	*125,700*	*11,754*	*305*
West Java	*231,290*	*91.25%*	*8.53%*	*0.22%*	*211,044*	*19,734*	*511*
Central Java	*122,141*	*91.25%*	*8.53%*	*0.22%*	*111,449*	*10,421*	*270*
DI Yogyakarta	*20,706*	*91.25%*	*8.53%*	*0.22%*	*18,894*	*1,767*	*46*

East Java	*188,641*	*91.25%*	*8.53%*	*0.22%*	*172,129*	*16,095*	*417*
Banten	*80,676*	*91.25%*	*8.53%*	*0.22%*	*73,614*	*6,884*	*178*
Total Java	***781,212***	*91.25%*	*8.53%*	*0.22%*	***712,830***	***66,655***	***1,727***
Total Sumatera - Java (83.77%)	***1,149,924***	*91.25%*	*8.53%*	*0.22%*	***1,049,268***	***98,115***	***2,542***
Outside Sumatera - Java (16.23%)	***222,714***	*91.25%*	*8.53%*	*0.22%*	***203,219***	***19,003***	***492***
Total Indonesia	***1,372,638***	*91.25%*	*8.53%*	*0.22%*	***1,252,487***	***117,117***	***3,034***

Table 6 Estimated Population Number of Transformers per Province per Manufacture Year

Province	Total Number of Transformers	Manufacture Year (percentage)					Manufacture Year (Number of Transformers)				
		< 1983	1983 - 1992	1993 - 2002	> 2002	N/A	< 1983	1983 - 1992	1993 - 2002	> 2002	N/A
Aceh	**26,114**	15.56%	24.67%	34.00%	25.18%	0.60%	4,064	6,442	8,878	6,575	156
North Sumatra	**47,908**	15.56%	24.67%	34.00%	25.18%	0.60%	7,455	11,818	16,287	12,062	286
West Sumatra	**43,359**	15.56%	24.67%	34.00%	25.18%	0.60%	6,747	10,696	14,740	10,916	259
Riau	**50,840**	15.56%	24.67%	34.00%	25.18%	0.60%	7,911	12,541	17,284	12,800	303
Jambi	**25,123**	15.56%	24.67%	34.00%	25.18%	0.60%	3,909	6,197	8,541	6,325	150
South Sumatra	**52,346**	15.56%	24.67%	34.00%	25.18%	0.60%	8,146	12,913	17,796	13,179	312
Bengkulu	**18,814**	15.56%	24.67%	34.00%	25.18%	0.60%	2,928	4,641	6,396	4,737	112
Lampung	**38,232**	15.56%	24.67%	34.00%	25.18%	0.60%	5,949	9,431	12,997	9,626	228
Kep. Bangka Belitung	**38,279**	15.56%	24.67%	34.00%	25.18%	0.60%	5,957	9,443	13,013	9,637	228
Kepulauan Riau	**27,699**	15.56%	24.67%	34.00%	25.18%	0.60%	4,310	6,833	9,417	6,974	165
Total Sumatra	**368,712**	15.56%	24.67%	34.00%	25.18%	0.60%	57,377	90,956	125,349	92,830	2,201
DKI Jakarta	**137,758**	15.56%	24.67%	34.00%	25.18%	0.60%	21,437	33,983	46,833	34,683	822
West Java	**231,290**	15.56%	24.67%	34.00%	25.18%	0.60%	35,992	57,056	78,630	58,232	1,380
Central Java	**122,141**	15.56%	24.67%	34.00%	25.18%	0.60%	19,007	30,130	41,523	30,751	729

DI Yogyakarta	***20,706***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	*3,222*	*5,108*	*7,039*	*5,213*	*124*
East Java	***188,641***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	*29,355*	*46,535*	*64,131*	*47,494*	*1,126*
Banten	***80,676***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	*12,554*	*19,902*	*27,427*	*20,312*	*481*
Total Java	***781,212***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	***121,568***	***192,713***	***265,584***	***196,684***	***4,662***
Total Sumatra - Java (83.77%)	***1,149,924***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	***178,945***	***283,668***	***390,934***	***289,515***	***6,863***
Outside Sumatra - Java (16.23%)	***222,714***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	***34,658***	***54,940***	***75,715***	***56,072***	***1,329***
Total Indonesia	***1,372,638***	*15.56%*	*24.67%*	*34.00%*	*25.18%*	*0.60%*	***213,602***	***338,608***	***466,648***	***345,587***	***8,192***

Table 7 Estimated Population Numbers of Transformers per Power Rating Category

Province	Estimated Total Number of Transformers	Power Rating			Number of Transformers per Power Rating		
		SPT (Small Power Transformer)	MPT (Medium Power Transformer)	LPT (Large Power Transformer)	SPT	MPT	LPT
Aceh	26,114	98.72%	1.15%	0.13%	25,779	300	35
North Sumatra	47,908	98.72%	1.15%	0.13%	47,294	551	64
West Sumatra	43,359	98.72%	1.15%	0.13%	42,803	498	58
Riau	50,840	98.72%	1.15%	0.13%	50,188	584	67
Jambi	25,123	98.72%	1.15%	0.13%	24,801	289	33
South Sumatra	52,346	98.72%	1.15%	0.13%	51,675	602	69
Bengkulu	18,814	98.72%	1.15%	0.13%	18,572	216	25
Lampung	38,232	98.72%	1.15%	0.13%	37,742	439	51
Kep. Bangka Belitung	38,279	98.72%	1.15%	0.13%	37,788	440	51
Kep. Riau	27,699	98.72%	1.15%	0.13%	27,344	318	37
Total Sumatra	**368,712**	98.72%	1.15%	0.13%	**363,985**	**4,238**	**489**
DKI Jakarta	137,758	98.72%	1.15%	0.13%	135,992	1,583	183
West Java	231,290	98.72%	1.15%	0.13%	228,325	2,659	307
Central Java	122,141	98.72%	1.15%	0.13%	120,575	1,404	162

DI Yogyakarta	20,706	98.72%	1.15%	0.13%	20,441	238	27
East Java	188,641	98.72%	1.15%	0.13%	186,222	2,168	250
Banten	80,676	98.72%	1.15%	0.13%	79,642	927	107
Total Java	**781,212**	98.72%	1.15%	0.13%	**771,196**	**8,979**	**1,036**
Total Sumatra - Java (83.77%)	**1,149,924**	98.72%	1.15%	0.13%	**1,135,182**	**13,218**	**1,525**
Outside Sumatra - Java (16.23%)	**222,714**	98.72%	1.15%	0.13%	**219,859**	**2,560**	**295**
Total Indonesia	**1,372,638**	98.72%	1.15%	0.13%	**1,355,040**	**15,777**	**1,820**

3.3. Estimated Total Population Volume of PCBs Contaminated Transformer Oil in Indonesia

The method for calculating the population can be found in the Statistic Report *2nd Phase of Extended PCB Inventory* in Indonesia 2020. In summary, Table 8 below shows data of the estimated total population volume of transformer oil contaminated with PCBs in Indonesia. Elaborated information based on Table 8 is as follows:

a) The estimated total population of transformer oil in provinces within the Sumatra island which is contaminated with PCBs within the range 50 ppm ≤ PCBs < 10,000 ppm is 62,909,603,98 kg and those which contaminated with PCBs within the range PCBs ≥ 10,000 ppm is 1,632,926,01 kg.
b) The estimated total population of transformer oil in provinces within the Java island which is contaminated with PCBs within the range 50 ppm ≤ PCBs < 10,000 ppm is 133,290,121,00 kg and those contaminated with PCBs within the range PCBs ≥ 10,000 ppm is 3,459,772,30 kg.
c) The estimated total amount of transformer oil outside the provinces in Sumatra and Java islands which is contaminated with PCBs within the range of 50 ppm ≤ PCBs < 10,000 ppm is 37,999,383,07 kg and those contaminated within the range PCBs ≥ 10,000 ppm is 986,338,76 kg.

The population of transformer oil in Table 8 was generated from active transformers (still in use/online transformers). For this reason, one option for managing the oil contaminated with PCBs within the range 50 ppm ≤ PCBs < 10,000 ppm is retrofilling[37]. If the age of the transformer is relatively old and it is no longer economical to maintain and to retrofill, the transformers can be managed as B3 waste (changed its status from online to offline) and the PCBs contaminated oil in the transformer should be further processed in accordance with applicable laws and regulations.

In terms of transformer oil contaminated with PCBs ≥ 10,000 ppm can be managed with thermal method by a licensed B3 waste company by complying with applicable requirements, including the destruction removal efficiency 99.9999% and does not produce other POPs emissions[38].

The total population of transformer oil in the provinces within Sumatra Island that is contaminated with PCBs within the range 50 ppm ≤ PCBs < 10,000 ppm is considered as the highest population of all. In this regard, it needs special attention for the procurement of services and facilities to manage PCBs in

[37] MoEF Regulation No. P.29/2020, Article 13 (2)
[38] MoEF Regulation No. P.29/2020, Article 18

Sumatra to allow the PCBs owners to test, retrofill and to dechlorinate the transformer oil.

At the time of writing this document, it has not been clearly identified whether there is a hazardous waste management company in Sumatra that is capable and has permit to treat transformer oil contaminated with PCBs ≥ 10,000 ppm with thermal method properly. If there is none, it is necessary to increase the capacity of the B3 waste companies/institutions at the local level so that they have the ability to treat oil contaminated with PCBs properly. Another option is to build a new facility in the region or send the oil from Sumatra Province to Java Province to be treated by a B3 waste company management in Java.

At the time of writing this document, it was identified that there are three companies in Java Island that have capability to treat oil contaminated with PCBs ≥ 10,000 ppm with thermal methods. Their total capacity is 51.000 kg or 51 ton per day[39]. The detail is as follows:

a) PT PPLI (*Prasadha Pamunah Limbah Industri*) has processing capacity of 50 tons per day;
b) PT AEI (*PT Arah Environmental Indonesia*) and PT TLI (*PT Teknotama Lingkungan Internusa*) are currently building thermal facilities to treat oil contaminated with PCBs greater than 10,000 ppm. Each facility has the capacity of 500 kg (0.5 ton) per day.

Based on the information aforementioned, the simulation for the thermal treatment of oil (LB3 waste oil) contaminated with PCBs ≥ 10,000 is as follows:

a) If the waste from Sumatra Province is sent to Java Province, the 1,632,926,01 kg (total volume of oil contaminated with PCBs ≥ 10.000) is divided by 51,000 kg (total capacity of LB3 facility), the approximately 32 days is required to treat/process the waste. Nevertheless, the feasibility of the waste treatment capacity in general is 70 percent of the optimal capacity. Therefore, 1,632,926,01 kg (total volume of PCBs contaminated oil) is divided by 35,700 kg (feasible total capacity of the LB3 waste facility) then approximately 46 days are needed to treat/process the waste. Nevertheless, the 46 days does not include the time needed for travel/transportation and for other administrative arrangements.
b) If the waste in the Java Province is managed in the Java Province, then 3,459,772,30 kg (total volume of oil contaminated with PCBs ≥ 10.000) divided by 51,000 kg (total capacity of the waste treatment facility). It would take approximately 68 days to treat the waste. However, considering the feasibility of the waste treatment capacity, it required approximately 97 days to treat the waste (not including travel time and other administrative arrangements).

[39] Based on FGD 20 October 2020

c) If the waste is located outside the Sumatra and Java Provinces, then 986,338,76 kg (total volume of oil contaminated with PCBs ≥ 10.000) divided by 51,000 kg (total capacity of the waste treatment facility). It requires approximately 19 days to treat it. However, considering the feasibility of the waste treatment capacity, it required approximately 27 days to treat the waste (not including travel time and other administrative arrangements).
d) There are 234,000 tons of transformer oil contaminated with PCBs with concentrations up to 10,000 ppm. Meanwhile, facilities that may soon operate are only able to treat the waste with a non-thermal method (dechlorination) with a capacity of 1000 tons per day (two shifts). In this case other non-thermal facilities are needed to be established.

Table 8 Estimated Total Population Volume of PCBs Contaminated Transformer Oil in Indonesia

Province	Estimated Total Number of Transfor-mers	Number of Transformers			Estimated Number of Contaminated Transformers (PCBs ≥ 50ppm)			Estimated Contaminated Oil Volume (Kg)				Estimated contaminated oil volume (kg) per contamination status	
		SPT	MPT	LPT	SPT 8.82% contami-nated	MPT 1.92% conta-mi-nated	LPT 16.67% contami-nated	SPT (Average 1640.27 Kg)	MPT (Average 24362.79)	LPT (Average 121466.67 Kg)	Total	50 ppm ≤ PCBs < 10000 ppm (97.47%)	PCBs ≥ 10000 ppm (253%)
Aceh	26,114	25,779	300	35	2,274	6	6	3,729,540.08	140,405.53	701,288.32	4,571,233.94	4,455,581.72	115,652.22
North Sumatra	47,908	47,294	551	64	4,171	11	11	6,842,060.53	257,582.21	1,286,554.66	8,386,197.40	8,174,026.60	212,170.79
West Sumatra	43,359	42,803	498	58	3,775	10	10	6,192,368.64	233,123.34	1,164,389.10	7,589,881.08	7,397,857.09	192,023.99
Riau	50,840	50,188	584	67	4,427	11	11	7,260,784.40	273,345.85	1,365,289.88	8,899,420.13	8,674,264.81	225,155.33
Jambi	25,123	24,801	289	33	2,187	6	6	3,587,942.69	135,074.84	674,662.90	4,397,680.42	4,286,419.11	111,261.31
South Sumatra	52,346	51,675	602	69	4,558	12	12	7,475,952.56	281,446.26	1,405,749.27	9,163,148.10	8,931,320.45	231,827.65
Bengkulu	18,814	18,572	216	25	1,638	4	4	2,686,909.94	101,153.77	505,236.18	3,293,299.88	3,209,979.40	83,320.49
Lampung	38,232	37,742	439	51	3,329	8	8	5,460,157.07	205,557.86	1,026,706.86	6,692,421.79	6,523,103.52	169,318.27
Bangka Belitung	38,279	37,788	440	51	3,333	8	8	5,466,855.19	205,810.02	1,027,966.35	6,700,631.56	6,531,105.58	169,525.98
Kep. Riau	27,699	27,344	318	37	2,412	6	6	3,955,847.97	148,925.32	743,842.39	4,848,615.68	4,725,945.70	122,669.98
Sumatera	**368,712**	363,985	4,238	489	32,104	81	82	52,658,419.07	1,982,425.00	9,901,685.92	**64,542,529.99**	**62,909,603.98**	**1,632,926.01**

DKI Jakarta	137,758	135,992	1,583	183	11,994	30	30	19,674,186.50	740,671.67	3,699,458.11	24,114,316.27	23,504,224.07	610,092.20
Jawa Barat	231,290	228,325	2,659	307	20,138	51	51	33,032,154.84	1,243,557.45	6,211,238.93	40,486,951.21	39,462,631.35	1,024,319.87
Jawa Tengah	122,141	120,575	1,404	162	10,635	27	27	17,443,746.98	656,702.59	3,280,054.87	21,380,504.43	20,839,577.67	540,926.76
Yogyakarta	20,706	20,441	238	27	1,803	5	5	2,957,209.77	111,329.71	556,062.31	3,624,601.79	3,532,899.37	91,702.43
Jawa Timur	188,641	186,222	2,168	250	16,425	42	42	26,941,127.74	1,014,249.31	5,065,905.70	33,021,282.75	32,185,844.29	835,438.45
Banten	80,676	79,642	927	107	7,024	18	18	11,521,932.38	433,764.76	2,166,539.70	14,122,236.84	13,764,944.25	357,292.59
Java	**781,212**	771,196	8,979	1,036	68,020	172	173	111,570,358.19	4,200,275.49	20,979,259.62	**136,749,893.30**	**133,290,121.00**	**3,459,772.30**
Sumatra – Java	**1,149,924**	1,135,182	13,218	1,525	100,123	254	254	164,228,777.27	6,182,700.48	30,880,945.54	**201,292,423.28**	**196,199,724.97**	**5,092,698.31**
Outside Sumatra - Java	**222,714**	219,859	2,560	295	19,392	49	49	31,807,344.37	1,197,447.16	5,980,930.29	**38,985,721.83**	**37,999,383.07**	**986,338.76**
Indonesia	**1,372,638**	1,355,040	15,777	1,820	119,515	303	303	196,036,121.64	7380147.64	36,861,875.83	**240,278,145.11**	**234,199,108.04**	**6,079,037.07**

3.4. Estimated Total Population of the Weight of Carcass of the PCBs Contaminated Transformers in Indonesia.

In summary, Table 9 below shows the data on the estimated total population of the weight of the equipment (transformers' carcass) contaminated with PCBs in Indonesia. Based on the table, the total population of the weight of the carcass to be decontaminated and/or treated is mostly found in Java, Sumatra and outside Java and Sumatra Provinces. The method for calculating this population can be found in the Statistic Report 2nd Phase of Extended PCBs Inventory in Indonesia, 2020.

Table 9 Estimated Total Population Equipment Weight of PCBs Contaminated Transformers in Indonesia

Province	Estimated Total Number of Transfor-mers	Number of Transformers			Estimated Number of Contaminated Transformers (PCBs ≥ 50ppm)			Estimated Equipment Weight of Contaminated Transformers (Kg)				Estimated Equipment Weight of Contaminated Transformers (kg) per contamination status	
		SPT	MPT	LPT	SPT 8.82% contami-nated	MPT 1.92% conta minated	LPT 16.67% contami-nated	SPT (Average 4,657.7 Kg)	MPT (Average 65,787.98)	LPT (Average 222,550 Kg)	Total	50 ppm ≤ PCBs < 10000 ppm (97.47%)	PCBs ≥ 10000 ppm (253%)
Aceh	26,114	25,779	300	35	2,274	6	6	10,590,377.70	379,143.62	1,284,893.35	12,254,414.67	11,944,377.98	**310,036.69**
North Sumatra	47,908	47,294	551	64	4,171	11	11	19,428,670.48	695,561.27	2,357,212.39	22,481,444.13	21,912,663.60	**568,780.54**
West Sumatra	43,359	42,803	498	58	3,775	10	10	17,583,809.63	629,513.84	2,133,381.90	20,346,705.37	19,831,933.73	**514,771.65**
Riau	50,840	50,188	584	67	4,427	11	11	20,617,676.06	738,128.58	2,501,470.26	23,857,274.90	23,253,685.84	**603,589.05**
Jambi	25,123	24,801	289	33	2,187	6	6	10,188,298.67	364,748.89	1,236,110.51	11,789,158.08	11,490,892.38	**298,265.70**
South Sumatra	52,346	51,675	602	69	4,558	12	12	21,228,666.17	760,002.49	2,575,599.55	24,564,268.21	23,942,792.22	**621,475.99**
Bengkulu	18,814	18,572	216	25	1,638	4	4	7,629,731.95	273,150.24	925,688.59	8,828,570.78	8,605,207.94	**223,362.84**
Lampung	38,232	37,742	439	51	3,329	8	8	15,504,626.42	555,077.49	1,881,121.90	17,940,825.80	17,486,922.91	**453,902.89**
Bangka Belitung	38,279	37,788	440	51	3,333	8	8	15,523,646.35	555,758.42	1,883,429.52	17,962,834.29	17,508,374.58	**454,459.71**
Kep. Riau	27,699	27,344	318	37	2,412	6	6	11,233,000.12	402,150.00	1,362,860.47	12,998,010.59	12,669,160.92	**328,849.67**
Sumatra	**368,712**	**363,985**	**4,238**	**489**	**32,104**	**81**	**82**	**149,528,503.55**	**5,353,234.83**	**18,141,768.45**	**173,023,506.83**	**168,646,012.10**	**4,377,494.72**

DKI Jakarta	137,758	135,992	1,583	183	11,994	30	30	55,866,691.73	2,000,070.31	6,778,109.60	64,644,871.64	63,009,356.39	**1,635,515.25**
Jawa Barat	231,290	228,325	2,659	307	20,138	51	51	93,797,891.55	3,358,036.28	11,380,168.93	108,536,096.76	105,790,133.51	**2,745,963.25**
Jawa Tengah	122,141	120,575	1,404	162	10,635	27	27	49,533,150.21	1,773,324.67	6,009,683.24	57,316,158.12	55,866,059.32	**1,450,098.80**
Yogyakarta	20,706	20,441	238	27	1,803	5	5	8,397,273.58	300,628.82	1,018,811.73	9,716,714.12	9,470,881.26	**245,832.87**
Jawa Timur	188,641	186,222	2,168	250	16,425	42	42	76,501,850.72	2,738,824.79	9,281,701.00	88,522,376.51	86,282,760.38	**2,239,616.13**
Banten	80,676	79,642	927	107	7,024	18	18	32,717,604.07	1,171,315.26	3,969,512.05	37,858,431.38	36,900,613.06	**957,818.31**
Java	**781,212**	**771,196**	**8,979**	**1,036**	**68,020**	**172**	**173**	**316,814,461.86**	**11,342,200.12**	**38,437,986.55**	**366,594,648.53**	**357,319,803.92**	**9,274,844.61**
Sumatera – Java	**1,149,924**	**1,135,182**	**13,218**	**1,525**	**100,123**	**254**	**254**	**466,342,965.41**	**16,695,434.95**	**56,579,755.00**	**539,618,155.36**	**525,965,816.03**	**13,652,339.33**
Outside Sumatera - Java	**222,714**	**219,859**	**2,560**	**295**	**19,392**	**49**	**49**	**90,319,927.75**	**3,233,522.51**	**10,958,199.79**	**104,511,650.05**	**101,867,505.30**	**2,644,144.75**
Indonesia	**1,372,638**	**1,355,040**	**15,777**	**1,820**	**119,515**	**303**	**303**	**556,662,893.16**	**19,928,957.46**	**67,537,954.78**	**644,129,805.41**	**627,833,321.33**	**16,296,484.08**

CHAPTER 4

NATIONAL ACTION PLAN FOR PCBs MANAGEMENT

The formulation of the national action plan for PCBs management has referred to the National Implementation Plan (NIP) 2008 and 2014 for the Stockholm Convention on Persistent Organic Pollutants (POPs). Furthermore, this action plan needs to be integrated with the recent NIP that is being drafted, considering that PCBs are part of POPs. In addition to referring to these documents, a brief stakeholder analysis and their capacities and roles in the elimination of PCBs were also conducted. In addition, the FGDs were very useful as sources of information to prepare this chapter.

4.1. Stakeholder Analysis

Stakeholder analysis is a method used by an organization to identify the parties associated with a project and to help formulate a strategy to engage them appropriately. Identification of stakeholders is very important to clarify roles and relationship, and determine different interests[40]. Stakeholder analysis is one of the strategies that need to be taken so that the target for the phasing out of PCBs by 2028 will be achieved.

Table 10 below shows several actors in the PCBs management. “Power” in the table is defined as the actor’s ability to influence the success of the ESM PCBs. “Interest” in the table is defined as the actor’s enthusiasm for ESM PCBs. Due to limited resources, the type of actors is not further elaborated into companies or organizations. The assessment of interest and power is conducted subjectively and qualitatively.

Table 10 Stakeholders Identification

No.	Actors	Interest	Power
1	Waste Treatment Companies	High	High
2	PCBs Owners	High	High
3	Transformers Maintenance/Service Providers	Moderate	High
4	Local Government/Regional Environmental Agency	Moderate	High
5	Laboratories	Moderate	Low
6	Academicians	High	Low
7	Non-Governmental Organizations	High	Low

[40] Using a stakeholder analysis to identify key local actors, Grassroot Collective, https://www.thegrassrootscollective.org/stakeholder-analysis-nonprofit

4.2. Disseminations and Trainings

The phasing-out of PCBs will require a series of dissemination and training, both on the regulation and policies adopted by the Government of Indonesia and with respect to technical aspects of ESM PCB. The target audience for dissemination and training should be differentiated and it will be elaborated in the sub sections below.

4.2.1. PCBs Owners/Owners of Electrical Equipment

Disseminations for company officers should be differentiated in accordance with different roles and decision-making levels. The technical department of a company often lacks financial support due to lack of understanding from the management.[41] Dissemination for managers and executives in the company must be tailored at a high level understanding of Indonesia's policy direction towards the environmentally sound management of PCBs, the legal responsibilities and obligations of companies and PCBs owners as well as the overall costs implications for companies. The dissemination is usually attended by the government to convey the government's commitment to the ESM PCB. The objectives of disseminations to company representatives are to:

- Encourage companies to internally declares their compliance regarding ESM PCB;
- Encourage companies to formulate a PCBs management plan (at company's level);
- Introduce incentive and disincentive within the GoI's policy regarding ESM PCBs, for example through PROPER (environmental rating program for companies);
- Ensure the compliance of the companies by selecting vendors/service providers that can guarantee that no cross contamination occurs during maintenance of the electrical equipment (transformers).

Dissemination for the operational staffs such as occupational safety and health and environment (OSHA/HSE) officers should be trained for a deeper understanding of the technicalities regarding environmentally sound management of PCBs. The objectives of dissemination and the training for the operational staffs are as follows:

- Educating the HSE officers regarding the Standard Operational Procedure (SOP) for the Management of Equipment and Material Containing PCBs and PCBs Code of Practice (see Annex 5.3. a and Annex 5.3.b);
- Deepening the understanding of the HSE officers regarding the SOP and PCBs Code of Practice;
- Promoting technical compliance regarding the ESM PCBs.

[41] Focus Group Discussion with companies participated in the inventory (companies that may own PCBs)

4.2.2. The Service Provider for the Maintenance of Transformers

One of the main routes of spread of PCBs in the environment is through cross-contamination of PCBs during the maintenance of transformers through previously contaminated equipment used to purify PCBs-contaminated transformer oil.[42] In Chapter 3, Chart 11 and Chart 12 show the possibility of cross-contamination in transformers manufactured above 1997.

Transformer maintenance companies should be one of the main targets for the dissemination of policies and regulations. However, the compliance must be ensured by convincing transformer owners/PCB owners to be selective in choosing vendors/service providers.

The staff of the transformer maintenance service providers must be equipped with technical knowledge on how to prevent cross-contamination. Thus, efforts to reach-out to service providers must have the following objectives regarding:

- Identification and labelling of PCBs/equipment (transformers) storage areas that are contaminated with PCBs;
- Protection of technicians from exposure to PCBs;
- Separation and maintenance of service provider equipment from PCBs contamination before and after the treatment process;
- Routine testing of the service provider's equipment used for maintenance of the equipment against the risk of contamination;
- Development of standard operational procedures for service providers in an effort to prevent PCBs contamination.

4.2.3. Local Government and/or Regional Environmental Agencies Officials

Local Government and/or Regional Environmental Agency (*Dinas Lingkungan Hidup/DLH*) officials are frontline officers in charge of supervising the management of PCBs in the regions. However, based on the focus group discussion (FGD) it was identified that there were various conditions faced by them such as a shortage of personnel/staff or inadequate equipment. In one district, it was revealed that there were no supervisory staffs. Other FGD participants gave their views on the intensity/frequency of employee rotation that caused a “gap” or loss of skills possessed by the Regional Environment Agency staff because the staff was reassigned.

Due to the lack of DLH officials manpower in the regions and frequent employee rotations, environmentally sound management of PCBs must rely on information technology in order to: (i) reduce the burden of supervision and (ii) maintain organizational knowledge. The reduction of the supervisory burden is achieved by providing access, training, and an online coordination platform on the PCBs national information system. Preservation of organizational knowledge can be

[42] PCBs Elimination Network Magazine, http://chm.pops.int/portals/0/download.aspx?d=UNEP-POPS-PCBSPEN-MAG-01.En.pdf

achieved through the application of knowledge management systems related to information systems. However, this can only be realized if *DLH* officers have adequate internet access. The objectives that need to be achieved in empowering the officials are:

- the ability to provide a thorough understanding of the Ministry of Environment and Forestry Regulation No. P. 29/2020 on PCBs;
- the ability to provide a thorough understanding of PCBs Code of Practice and standard operating procedures;
- the ability to provide an understanding of the legal implications of each aspect of PCBs removal;
- the ability to access and operate national PCBs information;
- the possession of adequate skills to perform inventory, identification and organizational knowledge by using knowledge management software.

4.2.4. Non Government Organizations and Academics

Disseminations and training must involve elements from non-governmental organizations and academics, namely environmental activists, students, lecturers and others. It should aim to raise awareness of the dangers of PCBs and to involve them in the PCBs removal process to the extent possible. This can be done through data exchange, involvement of NGOs and universities to monitor PCB phasing-out or research on PCBs concentration in the environment, biota, human body, etc.

4.2. Materials for Dissemination, Training and the Platforms

4.2.1. Dissemination of MoEF Regulation No. P. 29/2020 on PCBs Management

Minister of Environment Regulation No. P.29/2020 on PCBs Management is the main basis for PCBs elimination. It is important to elaborate the contents of the MoEF Regulation and disseminate it to the general public.

4.2.2. Training for Trainers on the ESM PCBs

Training for trainers on environmentally sound management of PCBs should be aimed at developing human resources at the company, government, and practitioner levels who are reliable and knowledgeable in accelerating the PCBs elimination process. Some of the materials for this training include:

- Inventory of equipment and dielectric oils containing PCBs (transformers, capacitors);
- Safe procedures for sampling;
- PCBs inventory and chain of custody;
- The theory and practice of conducting screen tests using the dexsil equipment;
- Preparation of PCBs inventory database;

- PCBs maintenance and PCBs cross contamination prevention.

4.2.4. Dissemination for General Public

Online dissemination on PCBs phasing out programs can be provided by the Ministry of Environment and Forestry on the PCBs website. The purpose of this online learning media is to provide a source of information on environmentally sound management of PCBs for stakeholders and the general public. Learning materials can be in the form of short videos with explanations or independent online courses. The content of the material can vary, ranging from understanding the Stockholm Convention, MoEF Regulation on PCBs Management and the PCBs management cycle that is environmentally sound.

4.3. PCBs National Information System

It is very important to build a PCBs national information system as a source of information, management, coordination and decision-making related to PCBs that is environmentally sound. The suggested system to be built is described in the following section.

4.3.1. Information System for PCBs

Environmentally friendly PCBs management includes the PCBs handling cycle from the beginning to the end. SIM PCBs should cover each of these management stages. On the other hand, the legal and bureaucratic set-up for B3 waste management separates B3 from B3 waste. This is reflected not only in the organizational structure of the Ministry of Environment and Forestry but also in the existence of an information system related to B3 and B3 waste management.

Currently, there are five information system platforms used by KLHK to manage B3 waste. The platforms are:

a) **SIB3POP** (B3 and Persistent Organic Pollutant Information System) which is used for B3 registration and delivery of B3 import realization, Mercury and POPs information media as well as real-time B3 import customs data (Secure File Transfer Protocol) integrated with INSW (Indonesia National Single Windows).
b) **Siraja** (PLB3 Online Performance Reporting Application) which is used by companies to report waste generated and received, as well as waste that has been managed and waste stored in temporary storage areas.
c) **Siratu** (Management Index Status Measurement Reporting Application) is a system used to calculate each company's waste status index.
d) **Festronik** (Electronic Manifest) is used to report waste transportation.
e) **Simpel** is a platform that is used for reporting compliance in the environmental field in general. The current Simple Platform is automatically connected to Siraja as well as air and wastewater emission.

As mentioned earlier, Siraja, Siratu and Festronic systems are used in waste management. Meanwhile, SIB3POP is used in B3 and POPs information management, including environmentally sound management of PCBs needs to include the status of online transformer (installed/currently being used in the power grid) and cannot be treated as waste. In addition, existing information systems cannot accommodate the important stage of phasing out PCBs such as the inventory stage. Thus, it is very important to build a standalone platform that can ensure that all stages of environmentally sound management of PCBs are covered.

Apart from that, the PCBs National Information System must also integrate all stakeholders involved in PCBs ESM, such as B3 owners, LB3 owners, as well as B3 and LB3 managers. Other parties that need to be incorporated in the PCBs National Information System are the laboratory network and PCBs consulting companies.

In order to ensure that the PCBs information system is integrated and operates properly and adequately, IT facilities support such as servers must have reliable specifications and are managed with adequate HR support at the level of Secretariat of the Director General (Sesdirjen) [43] with access that can be distributed among officials at the Directorate General of Waste, Waste and B3 Management as well as other stakeholders such as PCBs owners, Regional Environmental Service officials, and PCBs service providers.

PCBs national information system must comply with the Presidential Regulation on One Data. In this case, the system must adopt the principles of Open Data.

4.3.2. The Interconnection PCBs Management Information System with Simpel, Festronik, Siraja and Siratu Systems

The National PCBs Management Information System (SIM PCBs) should be integrated automatically with Simpel, SIB3POP, Festronik, Siraja and Siratu. Integration should be at least carried out in terms of (i) registration and (ii) data exchange between platforms. For example, for B3 and LB3 owners, simple registration should automatically become registration on SIM PCBs. Exchange of data between platforms can be done using the application programming interface (API).

The separation of status between waste and materials needs to be reflected in SIM PCBs as this will have implications for compliance incentives such as PROPER and temporary storage periods. Thus, transformers that are still online and contain PCBs need to be listed as B3 in SIM PCBs, while transformers that are to be destroyed must change their status as LB3.

Likewise, a change in the status of an item in SIM PCBs, for example from B3 to LB3 and from temporary storage to transportation should be reflected in Simpel, Siraja, Festronik.

[43] Interview with a MoEF Official, 7 October 2020

4.3.3. Information System Arrangement

The arrangement for the PCB Management National Information System (SIM PCB) will be elaborated in the following units.

4.3.3.1 Importation

To prevent PCB contaminated transformers from entering Indonesia, SIM PCBs need to have data related to importation of transformers or other PCBs entry routes. In the 2015 BPS Statistics Book (Central Bureau of Statistics), it is known that in January 2015 there were 647 kilograms of imports of HS Code 2710910000 waste oil containing PCBs, PCTs or PBBs. Meanwhile, for HS Code 3824820000 mix and preparation containing PBBs, PCBs, PCTs, there were 4791 kilograms of imports in that month. SIM PCBs need to be connected with customs and trade data.

In general, there is Prior Informed Consent (PIC) obligations in the Rotterdam Convention and other obligations under the Basel Convention regarding the movement of hazardous wastes between countries. For that, SIM PCBs need to be connected or at least be able to fetch data from INSW or INATRADE.

4.3.3.2. Identification and Labeling

The results of the identification process are the basis for the inventory and should form part of the SIM PCBs. All information in the identification report must be part of the SIM PCBs. This information includes, among others:

- Transformer related data. This includes weight, type of transformer, voltage, condition, labelling, information on transformer maintenance, brand of transformer oil, year of manufacture, brand of transformer, name of transformer manufacturer, country of origin, photo, geo location (GPS), location code, power rating, empty weight, asset number, transformer serial number, transformer condition and so on;
- Data related to the company owning the transformer, including contact person, name, position, company name, company address, number of employees, type of industry, electricity consumption and so on;
- Data related to the sampling officer, the company that conducted the sampling and when the sampling was carried out;
- Data related to samples, sample numbers and sample photos.

In order for all sample data to be easily traceable, sample numbering should be registered centrally. A sample number in the form of barcodes are issued automatically and randomly by SIM PCBs for laboratories and/or parties conducting inventories before the inventory is carried out (ex-ante). An alternative to this system is independent sample registration by the laboratory or the party carrying out the inventory to SIM PCBs, after the inventory and PCBs concentration analysis have been carried out (ex-post).

Through the identification process, responsible parties on business/activity obtains information about the condition of the transformer/capacitor (the equipment they own), would be very helpful for them in carrying out proper maintenance of their equipment, preventing cross-contamination of PCBs, and retrofilling the transformer carefully.

4.3.3.3. Register the Location of the Storage

Based on the identification and inventory, the storage location of the transformers/capacitors, and dielectric waste should be registered in the PCBs management information system.

4.3.3.4. Laboratory Certification

Laboratory certificates (laboratory test results report/LHU) must be submitted based on samples received by the laboratory. PCBs Management Information System (SIM) must record this certificate document in PDF form in addition to other information contained in the certificate.

The network of laboratories performing PCBs analysis should be laboratories that have been accredited by the National Accreditation Committee (KAN) and given access to input data directly into the PCBs SIM with the client's consent. PCB owners can be given the option to report test results (LHU) on SIM PCBs independently or authorize their laboratory to report LHU on SIM PCBs.

4.3.3.5. *Chain of Custody*

In principle, the Chain of Custody (CoC) requires that samples that have been tested in the laboratory can be attributed to the transformer where the dielectric liquid is taken, and that the test and sampling process can all be accounted for. CoC will be broken if there is one of the stages of sampling and laboratory tests whose validity cannot be accounted for. All documentation related to CoC, including custodian/guardian of each PCBs analysis process should be recorded on SIM PCBs.

4.3.3.6 Emergency Response and Accidents

Every incident, accident and emergency response, such as fire, flood, short circuit must be reported in SIM PCBs. Therefore, SIM PCBs must be able to receive information related to these events and then automatically contact the relevant DLH.

4.3.3.7. Transportation and Disposal

Waste Transportation and Disposal Companies that transport and dispose of PCBs waste must report the status of PCBs waste under their control. This can be done by acquiring data from Festronik and Siraja.

To facilitate tracking, each transformer and used oil can be assigned a unique number indicating its status and transfer from one party to another registered in SIM PCBs until it is finally destroyed.

4.4. The Readiness of Laboratory Network

The content of PCBs in transformer oil can be tested through screen tests and laboratory tests. Screen tests use potentiometric or other methods that are based on electrometric, colorimetric or physiology.[44] Laboratory test uses the IEC61619 (Gas Chromatography-ECD) method. In general, PCBs content can be confirmed by screen test. However, there are conditions where confirmation through IEC61619 is highly recommended, namely if the rapid test results show results that are specifically unreadable (e.g. “high ppm”).

When the Screen Test concentration is in the range of 40-60 ppm, the IEC61619 method is recommended to determine whether the PCBs concentration in the transformer is above or below the 50 ppm regulatory limit. In the event that the rapid test result is above 5000 ppm, confirmation of the IEC61619 method is also required because the accuracy of the rapid test decreases in this range. This confirmation is also necessary to ascertain whether the concentration of PCBs in the transformer is above 10000 ppm, which will require thermal destruction.

Based on the FGD results, around four (4) laboratories were able to examine PCBs on dielectric oil and only 1 (one) laboratory at the time of writing this document was certified with the IEC61619 method. The capacity to perform tests by the IEC61619 method in the laboratory is approximately 7 to 10 samples per day.

Furthermore, based on FGDs, laboratories are generally located on the island of Java. Meanwhile, based on national inventory (see Chart 5 and Chart 6) it is shown that in Sumatra Island, especially Riau Province, the percentage of PCBs contamination in transformers is quite high.

Increasing laboratory capacity in Indonesia is urgently needed through investment. Increased capacity to test using the IEC61619 method is urgently needed on the island of Sumatra.

4.5. PCBs National Inventory

PCBs inventory is an important stage in PCBs elimination process. The MoEF needs to ask the company to identify (as is required under the MoEF on PCBs Management) and also ask the company to create a database connected to SIM PCBs. Based on the Ministry of Environment and Forestry Regulation concerning PCBs, the

[44] MoEF Regulation No. P.29/2020, Article 9 (3)

identification of PCBs is expected to be completed in 2022. From the data provided by this company, the Ministry of Environment and Forestry can conduct another national inventory, if deemed necessary.

4.6. Temporary Storage

Based on statistical study, the majority of PCBs in transformers (82.68%) were detected on Java Island while the rest were on Sumatra Island. In Java, West Java, as well as East Java, Banten and Central Java, the percentage of PCBs is quite large. However, Java Island also has several temporary storage locations.

Based on the first FGD, several B3 waste processing companies already have temporary storage locations and are building temporary storage locations, including in Central Java (PPLI), Majalengka (PT TLI), Sukoharjo (PT TLI) and Bogor (PT TLI - Development).

On the island of Sumatra, Riau has the largest percentage, followed by North Sumatra. From the results of the FGD, it is not yet known whether there is a temporary storage area in Sumatra Province.

The government needs to facilitate and coordinate so that processing and transportation companies that have temporary storage networks can lease their facilities before PCBs are being transported to the final disposal site.

Under the Stockholm Convention, transformers/capacitors and/or dielectric oil contaminated with PCBs cannot be stored in densely populated areas or in areas close to food, beverage and feed production areas. In addition, dielectric oil contaminated with PCBs cannot be mixed in one container with another dielectric oil, to avoid cross-contamination.

Minister of Environment and Forestry Regulation No. P.12/MENLHK/Setjen/PLB.3/5/2020 concerning Storage of Hazardous and Toxic Waste is one of the main references in storing B3 waste containing PCBs. What needs to be added is that B3 waste containing PCBs should not be stored in one container with other B3 waste to avoid the risk of cross contamination.

The Standard Operating Procedures (Appendix 5.3.a) and PCBs Code of Practice (Appendix 5.3.b) attached to this document elaborates prerequisites for temporary storage to meet certain standards to prevent leakage, spillage and infiltration of PCBs into groundwater.

4.7. Transportation

Transportation of PCBs and/or equipment contaminated with PCBs must meet the requirements for the transportation of B3 and B3 waste.

Transportation of B3

Transportation of equipment containing PCBs less than 50 ppm can be categorized as transportation of B3 or hazardous materials. Government

Regulation No. 74/2001 on B3 Management requires carriers to be equipped with a Material Safety Data Sheet (MSDS). Furthermore, PP No. 74/2001 refers to the applicable transportation regulations related to the suitability of each type of conveyance.

General provisions regarding transportation on the road related to hazardous materials are regulated in PP No. 74/2014 concerning Road Transportation. Further provisions are stipulated based on the Regulation of the Minister of Transportation No. PM 60/2019 concerning the Implementation of Transportation by Motorized Vehicles on the Road.

Transportation of B3 Waste

Oil containing PCBs and/or equipment containing PCBs of more than 50 ppm is considered as B3 Waste Category I. B3 waste transportation must comply with the provisions of Minister of Environment and Forestry Regulation No. P.4/2020 concerning Transportation of Hazardous and Toxic Waste.

In this case, closed conveyance must be used to transport B3 waste. B3 waste carriers must have a letter of recommendation to transport B3 waste from the KLHK and a permit related to B3 waste management for transportation activities, issued by the Ministry of Transportation. This can be excluded for parties who: a) transport B3 and B3 waste within the company area in accordance with environmental permits and do not pass through public roads, b) transportation of B3 waste at sea by ship from offshore facilities to the onshore facility area located at industrial area in accordance with the environmental permit.

As elaborated in subsections 4.3.1 and 4.3.2 above, the transport of waste PCBs must be registered with Festronik, Siraja as well as SIM PCBs.

In addition, if transportation involves more than one company or more than one mode of transportation, there should be no difference in the records of the total volume transported by one mode/company to another[45].

4.8. Facilities for the PCBs Treatment and Management

Based on the prevailing policy, dielectric oil with PCBs concentration greater than 10000 PPM and porous solid material shall be treated with thermal technology. Meanwhile, dielectric oil containing PCBs below 10000 ppm and non-porous solid material can be treated by non-thermal technology.[46]

Currently, based on FGD, there is only 1 (one) company that can process PCBs with non-thermal technology (dechlorination) and is expected to start operating in early 2021. The estimated price for destruction is USD 5 per kilogram. This price is for

[45] One of the issues arose in the FGD was weather the volume that should be recorded was the volume received by the transporter from the B3 waste generator or the volume from "unloading process" received by Transporter II from Transporter I.

[46] MoEF Regulation No. P.29/2020, Article 19, Article 20

destruction only; it does not include carcass and porous material processing. The price also does not include costs for transportation, customs, handling and permits.

In terms of processing by thermal method, based on the FGD, [47]several incinerators have been or are being built. Among them are *PT Arah Environmental Indonesia/AEI* (500 kg/hour – already built); and *PT Teknotama Lingkungan Internusa/TLI (*planned to be built in 2021 with a capacity of 500 kg/hour]; *PT Prasadha Pamunah Limbah Industri (*PPLI) is building an incinerator with a capacity of 50 tons per day. However, the combustion method for PCBs has strict requirements and is less recommended under the Stockholm Convention.

By looking at the statistical data in Chapter 3 based on Table 5, the estimated total population volume of contaminated transformer oil (50 ppm PCBs < 10000 ppm) is quite large and spread across Java, Sumatra and outside Java and Sumatra. Considering that the sample population is a transformer that is still in use (online), the provision of facilities and infrastructure to manage PCBs such as retrofilling, testing, dechlorination, and others is very much needed. In addition, the procurement of non-thermal PCBs processing facilities needs to be prioritized.

4.8.1. Ideal Distribution of the Treatment Facilities

Currently non-thermal facilities (PPLI) are located on the island of Java, as well as thermal facilities. Non-thermal facilities need to be prioritized and established in Java and Sumatra because these locations (particularly in Banten and Riau Provinces) have many transformers contaminated with PCBs.

4.8.2. Investment Promotions

Investments in environmentally sound management of PCBs can be encouraged by providing fiscal incentives or licensing facilities to import and/or procure equipment for laboratories such as reagents, PCBs testing kits, waste treatment facilities, etc.

4.9. The Disposal of State-Owned Enterprises (SOE) Assets

Electrical equipment belonging to State-Owned Enterprises (BUMN) such as transformers, capacitors containing or contaminated with PCBs may need to be disposed of. Transformers that contain PCBs and where it is deemed uneconomical to decrease the levels of PCBs may need disposal by transferring it to a company that can treat the waste. The dielectric oil containing PCBs will be treated (solidified) and the transformer will be disassembled and decontaminated.

However, if the electrical equipment is owned by a BUMN, it is subject to BUMN regulations regarding asset disposal. Based on the Minister of SOE

[47] Ibid

Regulation No. 02/MBU/2010[48] as amended (hereinafter referred to as "SOE Minister Regulation No. 02/MBU/2010"), consideration and/or approval or refusal from the Minister of SOEs and/or the Board of Commissioners may be required for asset write-off, following up on proposals from the Board of Directors.

Article 14 (3) Regulation of the Minister of SOEs No. 02/MBU/2010 provides that companies can regulate them in more detail. Thus, the conditions of each company may differ, depending on its articles of association. Therefore, it is important for every BUMN that has electrical equipment to check its articles of association to ensure the mechanism for asset write-off.

Article 17 Regulation of the Minister of SOEs No. 02/MBU/2010 requires the Board of Directors to make a written proposal regarding the write-off of assets accompanied by a "legal assessment/study" of the asset, an economic assessment (including benefits, potential and added value for SOEs) and an elaboration of the reasons for the write-off of the asset.

In providing this justification, it is important for SOEs to consider retrofilling options by estimating asset life (plus retrofilling costs) versus processing/disposal costs. If the asset has a long life and retrofilling costs are relatively low compared to processing/disposal costs, it may make more sense to use the retrofilling option instead of disposal (and replace the equipment with a new one). This analysis will form part of the economic assessment for asset write-offs.

It is important in the legal assessment to include an assessment of the MoEF on PCBs, Government Regulation No. 22/2021, Government Regulation No. 74/2001, and the Stockholm Convention and the possible implications of inaction on company licenses and rankings in the PROPER program. This assessment is necessary to provide a strong legal justification for the assets disposal plan.

Given the complexity of asset write-offs in SOEs and the bureaucratic time frame required to process the write-off proposals, it is highly recommended that SOEs have a large amount of electrical equipment to prepare an enterprise-level PCBs management plan. Together they should set up the timeline for this process, from identification, inventory to asset write-off proposals and approval until final release. The regulations regarding the release of SOEs are as follows:

- SOE Minister Regulation No. Per- 02/MBU/2010
- SOE Minister Regulation No. Per-06/MBU/12/2014
- SOE Minister Regulation No. Per-22/MBU/12/2014
- PT PLN Internal Regulation No. 1233/Kep/Directors/PTK/Dir/2011

Based on the FGD[49], there are concerns from PT PLN regarding the release/removal of assets containing B3 waste. The above regulations cover general asset disposal procedures and the process can take a long time. For PT PLN, it must be processed through proposals from related units, followed by field inspections, decisions of commissioners/directors and the Minister of SOEs. Disposal/removal of

[48] SOEs Regulation No. 02/MBU/2010 on Procedure for Write Off and Transfer of Fixed Assets of the State Owned Enterprises, see Article 2

[49] FGD 18 November 2020

assets containing B3 waste must be carried out and the process should be expedited because of the potential for contamination and to meet the requirements for B3 waste management.

4.10. PCBs Management Plan at The Company Level

Although not mandatory, it is highly recommended for companies with transformers contaminated with large quantities of PCBs to develop an Enterprise Level PCBs management plan. There is no uniform standard in making the Company Level PCBs Management Plan because it will depend on the conditions of each company. However, the Enterprise Level PCBs Management Plan should at least consists of:

- Inventory and Identification Plans, including transformer downtime plans;
- Location and information about equipment;
- The economic calculation of retrofilling versus disposal;
- Plans for preparing asset write-offs (especially for SOEs);
- Plans for preparing temporary storage areas;
- Transportation plan;
- Processing and disposal plans,
- Company hazard and emergency response plans related to PCBs;
- PCBs contamination monitoring plan at enterprise level;
- Reporting into SIM PCBs;
- Calculation of the overall cost of managing PCBs in an environmentally sound manner.

4.11. PCBs Monitoring in the Environment

Monitoring of PCBs in the environment needs to be carried out by companies and/or service providers that own/store/maintain/process dielectric oil containing PCBs and/or equipment contaminated with PCBs in their facilities. In addition, the Ministry of Environment and Forestry can carry out national monitoring programs or monitoring of PCBs in the environment (biota, soil) in collaboration with universities, laboratories and other institutions both at home and abroad. Currently, laboratories in Indonesia are able to detect PCBs in aquatic biota and soil samples.

4.12. Formulating Policies with Relevant Regulators

In order to achieve the PCBs elimination target by 2028 by adopting a circular economy, there are several policies that must be discussed with other government agencies: (i) PCBs-free equipment procurement program, (ii) Asset elimination planning with the Ministry of SOEs and (iii) Import prohibition for goods containing PCBs.

4.12.1. Procurement Programs for PCBs Free Equipment

Dissemination and Procurement for Regenerated Dielectric Oil

In order to achieve a circular economy, the regenerated transformer oil from PCBs processing needs to be socialized to the industry. In addition, the specifications for regenerated transformer oil must be included in the e-catalogue list used by SOEs and the Government. This requires discussions with LKPP, the Ministry of Energy and Mineral Resources and the Ministry of SOEs.

Vendor Procurement for PCBs Free Transformers Maintenance

No less important in preventing cross-contamination is the assurance that transformer maintenance is carried out by a vendor who understands the PCBs-free transformer maintenance process. It is not enough to do this from the supply side (socialization with transformers maintenance vendors). It would be more effective if it is done by means of demand management by ensuring that the company will only choose vendors who can guarantee that cross-contamination will not occur.

Vendor procurement of this PCBs-free transformer maintenance should be a part of the company's procurement policy. In order to be properly adopted, this policy needs to be coordinated with the Ministry of SOEs and the Ministry of Energy and Mineral Resources.

4.12.2. Planning for Asset Disposal with the Ministry of State Owned Enterprises

As previously described, for SOEs, the disposal of transformer assets sometimes requires the approval of the company's organs, both the Commissioner and the General Meeting of Shareholders (GMS). For SOEs, the GMS can mean the Minister of SOEs. Therefore, to obtain approval from the Ministry of SOEs, it is necessary for MoEF to explain the target for the destruction of PCBs by 2028 to the Ministry of SOEs.

In the future, workshops can be held together with the Ministry of SOEs and the Ministry of Energy and Mineral Resources regarding the plan to eliminate transformer assets belonging to SOEs and their justification. Prior to this workshop, SOEs should first have economic and legal justifications, as referred to in SOE Ministerial Decree 02/MBU/2010. To be able to obtain this economic justification, SOEs need to first calculate the lifetime of the asset and whether the retrofilling option can be taken before deciding to write off the asset.

4.12.3. Policy to Ban the Importation of PCBs and PCBs Contaminated Equipment

As stated above, there are records of imports of goods with HS Code 2710910000 (waste oil containing PCBs, PCTs or PBBs) and HS Code 3824820000

(mix and preparation containing PBBs, PCBs, PCTs). To avoid this from reoccurring, it is necessary to coordinate with the Director General of Customs and Excise to discuss the policy on the importation of goods that clearly contain PCBs or are suspected to contain PCBs.

5. Annexes

5.1. National Action Plan for PCBs Management

5.2. Statistic Report 2nd Phase of Extended PCBs Inventory in Indonesia 2020

5.3.a. Standard Operational Procedure for the Management of Equipment and Material Containing PCBs

5.3.b. PCBs *Code of Practice*

Annex 5.1. Timeline: National Action Plan for PCBs Management

Action Plan	Performance Indicator	Stakeholders	Status of Achievements	Achievements (Year)
The enactment of regulation(s) for the phasing out PCB and the publication of guidelines/documents regarding ESM PCB.				
The enactment of the Minister of Environment and Forestry Regulation on PCB.	The enactment of a MoEF Regulation on PCB	Industry, Government, General Public.	The MoEF Regulation on the Management of PCBs is enacted.	2020
The issuance of guideline(s), publication (s), campaign materials for the phasing out of PCBs	Availability of draft guidance, publications, campaign materials.	Industry, Government, General Public.		2021
PCB National Inventory Phase 2	Availability of inventory data	Industry, Government, General Public.	Finalization of the report 2nd phase of PCBs inventory	2021
The issuance of the National PCBs Management Plan (document).	Availability of the document	Industry, Government, General Public.	Finalization of the document.	2021
Formulation of POPs inventory guideline (PCBs inventory is included in the document).	Availability of POPs inventory guideline (PCBs inventory is included in the document).	Industry, Government, General Public.	In the drafting process.	2021
Disseminations and Stakeholders Engagements				
Dissemination of MoEF Regulation and ESM PCB (see Chapter 4 on Dissemination unit)	Dissemination activities and materials.	Industry, Government, General Public.	Planning for the dissemination activities.	2021 - 2022
Capacity Buildings				
Strengthening the capacity of laboratory and the human resources (see Chapter 4 on Readiness of Laboratories)	Laboratories are certified. Human resources are sufficient.	Government, Laboratory, Service Providers		2028
Trainings for the stakeholders such as PCBs owners (owners of PCBs contaminated equipment), service providers (vendor for the maintenance of transformers), local	Availability of training materials and list of participants.	Industry, Government, Service Providers, University.		2028

environmental agency staffs/local government agency staffs, general public, academia (see Chapter 4 Disseminations and Trainings unit).				
Developing and strengthening the capacity of PCBs National Information System (see Chapter on PCB National Information System)	Availability of the information system	Government, Industry, General Public.	MoEF information system is available (it needs to be integrated with PCBs information system).	2021
Human resources development (capacity building) to enable them to manage the PCB Information system (see Chapter 4 on PCBs National Information System).	Human resources are sufficient in terms of numbers and skill.	Government, Industry, Service provider, General public.		2022
Environmentally Sound Management of PCB				
Establishing a licensing system e.g license for transportation, temporary storage, etc (see Chapter 4 on Transportation and Temporary Storage)	The Government facilitates licensing pertaining to ESM for various stakeholders.	Government, Industry, Service Provider.		2021
Organizing a regular national PCBs inventory and identification (see Chapter 4 on Identification and Labelling).	Regular national PCBs inventory and identification are planned.	Government, Industry, Service Provider, General Public.		2022
Establishing temporary storage facilities for B3 waste contaminated with PCBs (see Chapter 4 on the Temporary Storage)	Temporary storage for B3 waste contaminated with PCBs is available.	Government, Industry, Service Provider.		2022
Establishing PCB treatment facility/treatment based on BAT/BEP Pembangunan (see Chapter 4 on B3 Waste Management and Treatment Facilities)	Treatment facility plant is available.	Government, Industry, Service Provider.		2028
PCBs monitoring (see Chapter 4 on PCBs Monitoring in the Environment).	Availability of the monitoring report	Government, Industry, University.		2028

Formulation of PCBs Management Plan at a company level (see Chapter 4 on PCBs Management Plan at The Company Level)	Availability of PCBs Management Plan at a company level.	Government, Industry, Service Provider.		2022
Asset Disposal by the State Owned Enterprises (SOE/BUMN)				
Asset disposal by the SOE for the phasing out of PCB (see Chapter 4 on The Disposal of SOE Assets)	There are numbers of assets (transformers) ready being disposed by SOE	Government, Industry, Service Provider.		2028
Initiatives regarding issuance of relevant regulations/policy				
Promoting investment and incentives for ESM PCB e.g. simplifying procedures for importing reagents, PCBs free equipment, importing non-combustion disposal technology, tax incentives and etc. (see Chapter 4 on the Formulation of Policies with Other regulators)	There is an initiative to promote incentive for importing PCB free equipment (e.g. import tax discount, administrative assistance, etc.).	Government, Industry, Service Provider.		2022
Promoting PCB free equipment for procurement (see Chapter 4 on Procurement for PCBs Free Equipment).	There is an initiative and/or a policy to procure PCB Free equipment.	Government, Industry, Service Provider.		2022
Prohibiting the importation of PCBs, waste containing PCB and/or equipment contaminated with PCB (see Chapter 4 on Importation Policy)	There is an initiative or a policy regarding the prohibition of importing PCB, waste containing PCB and/or equipment contaminated with PCB.	Government, Industry, Service Provider, General Public.		2028
Reporting				
Reporting to the Stockholm Convention Secretariat	Availability of a report to the Stockholm secretariat regarding the status of the phasing out PCB			Twice a year