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PCB Elimination

PART I: Elimination strategy

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Objective

Once the presence of PCBs in the equipment has been identified and quantified, the elimination of the contaminant will be necessary according to Article 6, d) (II) of the Stockholm Convention.
For the elimination, it will be important to have sufficiently proven and widely applied technologies with success.

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Scope

PCB elimination covers all equipment containing liquids with a PCB concentration:

≥ 50 ppm

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The PCB elimination strategy should also have in mind the principles of PCB managment:

Principle of regional Integration

Principle of life-cicle management

Principle of the development and transfer of technology

Principle of safety and prevention

Regulatory policy

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Steps for elimination strategy

Step 1
Declaration

Step 2
Inventory Data Collection

Step 3
Inventory Data Analysis

Step 4
Strategy Selection

Step 5
Rationalization

Step 6
Implementation

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1. Declaration

Step 1

Declaration

When a country or organisation decides that PCBs will be collected and disposed of and this is declared the entire process commences at the point of declaration.
The declaration should state:

- The boundaries of the disposal (e.g. only government agencies or also private or public companies with PCB stocks)
- Who will pay for the disposal
- Rules about end of service life for equipment contaminated with PCBs

The declaration of disposal needs to be short, clear and concise as to the boundaries of the project.
Without a clear declaration it will be difficult to determine which stocks are to be disposed of and which are not.

Step 2

Inventory Data Collection

The whole process of selecting the destruction or decontamination stage is entirely dependent on the quality and quantity of the information obtained during the inventory phase.

When collecting data for PCB inventory there are four fundamental questions to be asked.

What is it?

Where is it?

How much is there?

Who owns it?

2. Inventory Data Collection

Step 2

Inventory Data Collection

These questions are answered by the provision of the following data against the following segments:

- In service transformers
- Out of service transformers
- Inservice capacitors
- Out of service capacitors
- Bulk storage tanks, drums and containers?

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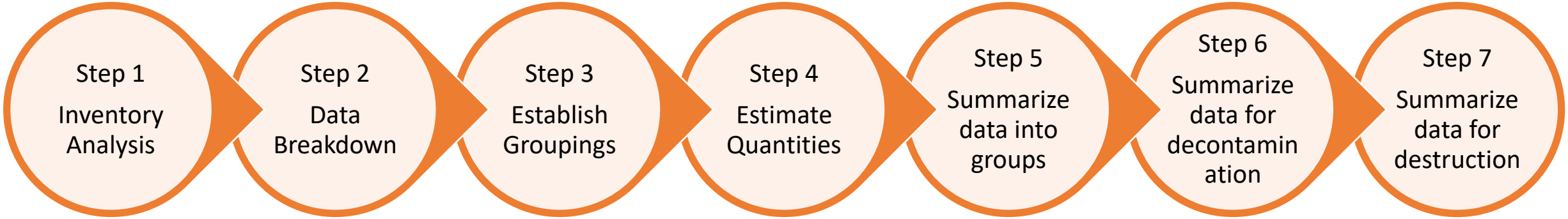
3. Inventory Analysis process for PCBs

Step 3

Inventory Data Analysis

The information contained in the inventory analysis allows us to commence the planning required to derive a destruction and decontamination strategy.



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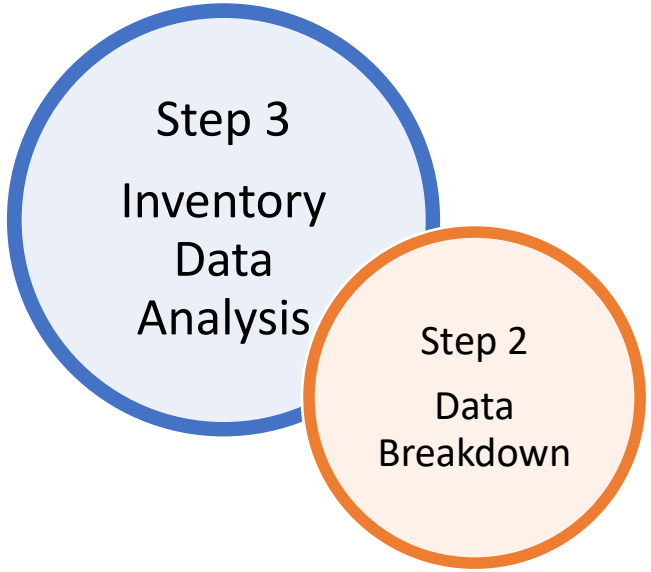
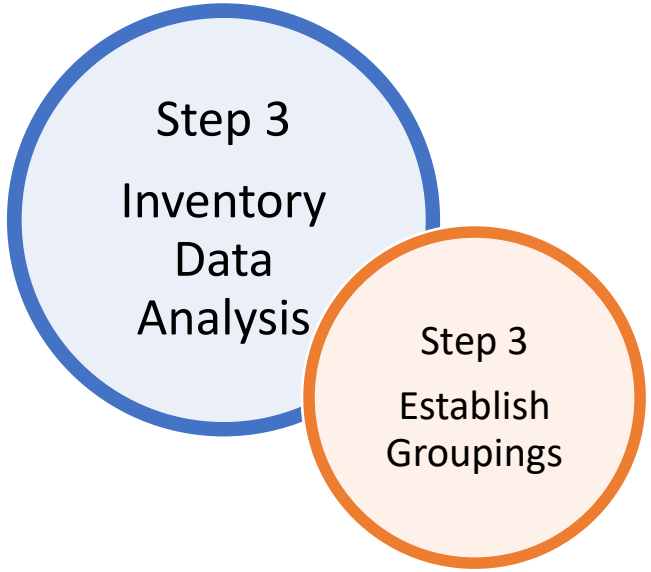
3. Inventory Analysis process for PCBs



- When the PCB inventory is finalized, a breakdown of the information in the database is required.
- This breakdown is designed to identify the amounts and characteristics of the PCB waste material so that it can be grouped.
- The grouping will help to assign appropriate technology for elimination.

→ This will result in two general categories: material for decontamination and material to be destroyed.

3. Inventory Analysis process for PCBs



PCB waste should be grouped first into

- equipment in service or out of service
- then by their capacity: below or above 500 kilo-volt-ampere
- and then by their PCB concentrations

The groupings below are suggested to choose the appropriate technology for the decontamination or destruction of the equipment with PCB:

- Group 0: All equipment containing less than 50 ppm
- Groups 1-6 equipment in service ranging from 50 ppm to various PCB concentrations
- Groups 7-14 equipment which is no longer in service ranging from 50 ppm to various PCB concentrations
- Groups 15 to 19 are specific groups such as in service capacitors or storage tanks.

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3. Inventory Analysis process for PCBs

Step 3
Inventory Data Analysis

Step 3
Establish Groupings

Size	< 50 ppm	50 to < 500 ppm	500 to < 5000 ppm	5000 to < 50 M ppm	50 M to < 900 M ppm	Condition
All sizes	GP0					In service
< 500 kVA		GP1	GP2	GP3		
> 500 kVA		GP1	GP4	GP5	GP6	

Size	< 50 ppm	50 to < 500 ppm	500 to < 5000 ppm	5000 to < 50 M ppm	50 M to < 900 M ppm	Condition
All sizes	GP0					Out of service
< 500 kVA		GP7	GP8	GP9	GP10	
> 500 kVA	GP0	GP11	GP12	GP13	GP14	

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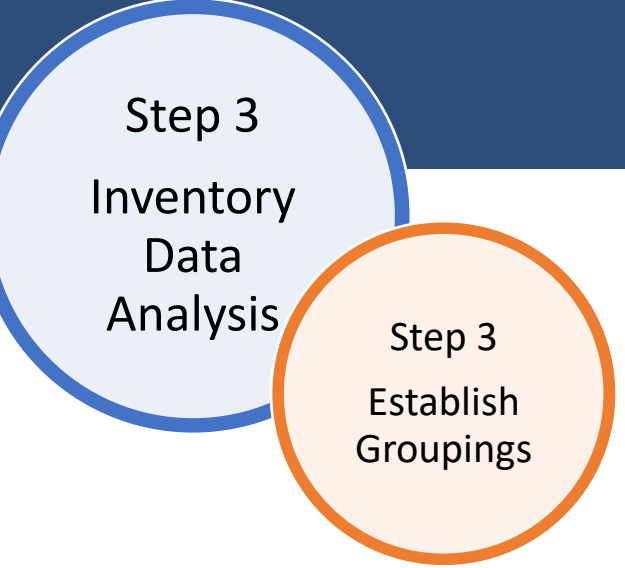
3. Inventory Analysis process for PCBs



GP 15 Empty out of service transformers

Gp 16 In service capacitors

Gp 17 Out of Service capacitors

Gp 18 Storage tanks with oil less than 50ppm

Gp 19 Storage tanks with oil greater than 50ppm

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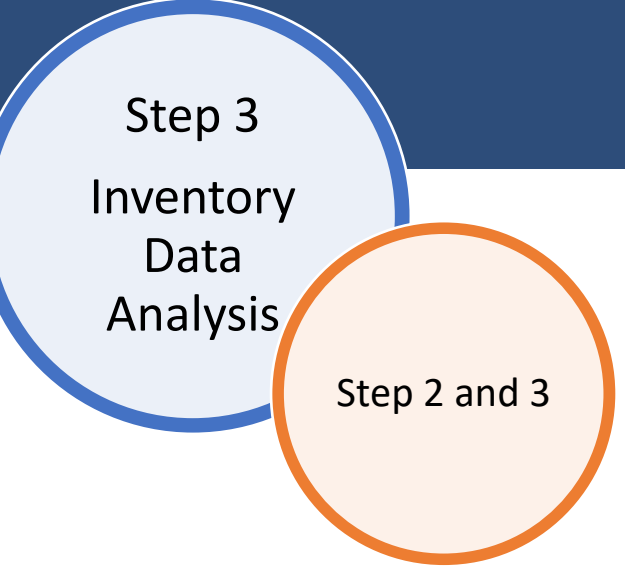
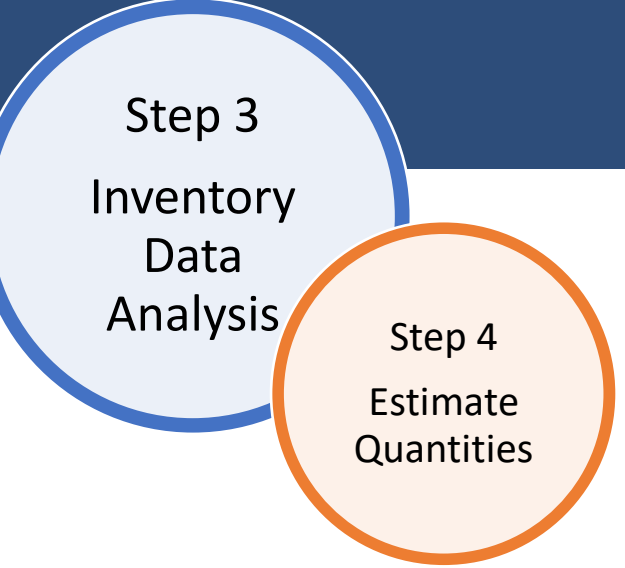


Example of data breakdown and grouping

PCB Inventory Analysis - Step 2 Data Breakdown

PCB Type	Manu	Type No.	Service No.	Owner	KVA/r	Total Weight Kg	Oil Wt Kg	Oil Qty Litres	PCB ppm	Gp
T/F	ABB	TM	134	TPC	250	450	185	250	>50	1
T/F	Tyree	OB	145	TPC	5000	12500	2500	4000	>50000	6
Caps	T&J	TYY	1485	PDC	125	60	25	35	5000	16



Step 4 Inventory analysis involves estimating the quantities of PCB oil and PCB contaminated materials.

PCB Inventory Analysis - Step 4 Estimate quanitites

	Oil Wt Kg	Oil Qty Litres	PCB ppm	Gp	Qty Decon Oil Kg	Qty Decon Mat Kg	Qty Destr PCB Kg
	2500	4000	>50000	6	2500	10000	2500
	25	35	5000	16	25	55	55

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3. Inventory Analysis process for PCBs

Step 3

Inventory Data Analysis

Step 5

Summarize data into groups

PCB Inventory Analysis - Step 5 Summarise data

Gp	Qty Decon Oil Kg	Qty Decon Mat Kg	Qty Destr PCB Kg
2	3540	10000	3540
3	2687	55	55
4	15000	28000	15000
5	29500	48900	29500
6	16500	29500	16500

Step 5 Inventory analysis involves reordering the data into the group total quantities and summarised across decontamination and destruction.

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3. Inventory Analysis process for PCBs

Step 3

Inventory Data Analysis

Step 6

Summarize data for decontamination

Step 7

Summarize data for destruction

Gp	Qty Decon Oil Kg	Qty Decon Mat Kg	Total Decxon Kg
1	2560	9562	12122
2	0	10000	10000
3	2687	55	2742
4	0	28000	28000
5	0	48900	48900
6	0	29500	29500
		TOTAL	131,264

Gp	Qty Decon Oil Kg	Qty Dest Mat Kg	Total Destr Kg
1	0	0	0
2	3540	0	3540
3	0	0	0
4	15000	0	15000
5	29500	0	29500
6	16500	0	16500
		TOTAL	64,540

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Step 4

Strategy Selection

The analysis of the PCB inventory will allow us to initiate the planning and design of the elimination strategy based on an informed decision.
For that we may need to consider a number of questions, for example:

- Which disposal or treatment options are available? Are they cost-effective and logistically realistic?
- Given the amount of PCB oil, should the country import the technology for example mobile incinerator or dichlorination units or should it be exported to another country with the appropriated technology installed?
- Can the recycling business cope with the materials from the decontamination processes?
- What pretreatment can be done (e.g. retro filling or solvent washing)
- And so on.

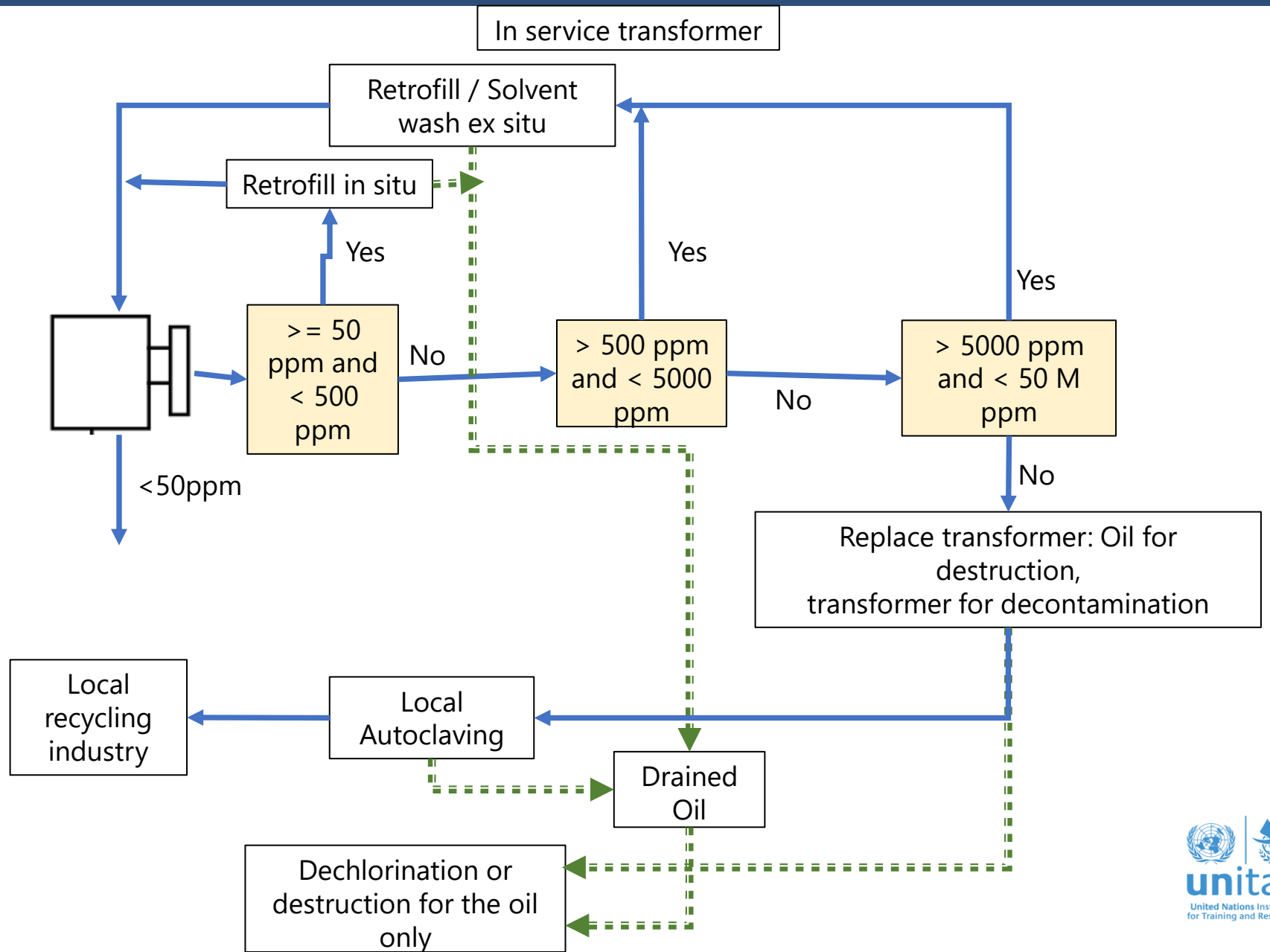
The decision must be framed within the concept of environmentally sound management, minimization of transboundary movements and sustainability as well as economic considerations.

4. Strategy Selection

Step 4

Strategy Selection

Selection of suitable technologies to groups.



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Step 4

Strategy Selection

Pretreatment – Retro filling

Most treatment or disposal technologies require pretreatment.

Retro filling can be applied for e.g.:

- transformers with concentrations below 500 ppm (in situ or ex situ)
- or for transformers with higher concentration prior to treatment such as autoclaving.

Process:

Retro filling means to drain the transformer and replace the old dielectric oil by new PCB-free oil. The remaining old oil, which is usually 3-8% of the transformers volume, that is captured in the interior of the transformer will mix with the new oil over time.

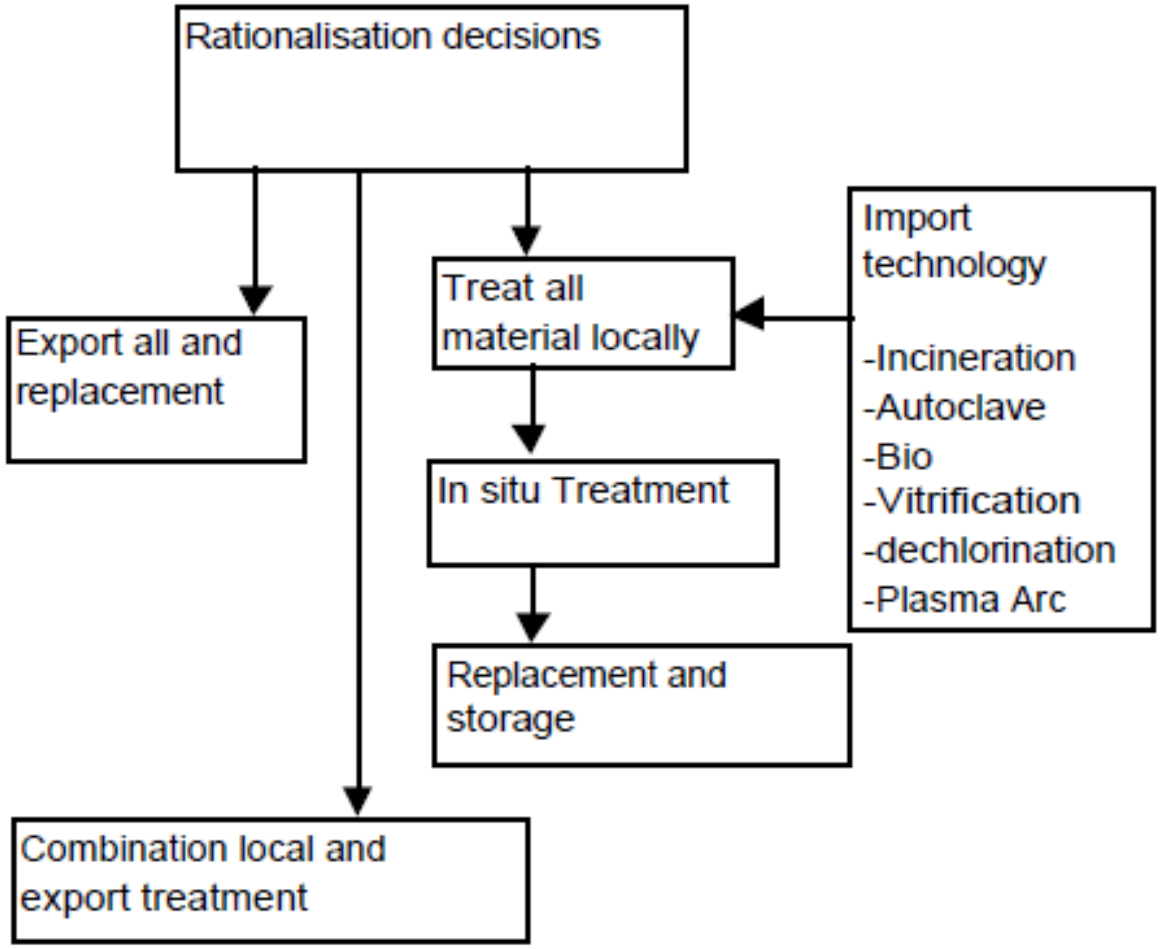
For transformers that had concentrations of 500 ppm can now be reclassified to below 50 ppm or retro filling can be repeated for transformer that had higher contamination until the new oil reaches below 50 ppm. The drained oil must be dechlorinated or incinerated.

5. Rationalization

Step 5

Rationalization

At this step major decisions are made based on the country situation and size of the waste to be disposed. It is during this stage that the requirements of environmentally sound management are delivered.



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5. Rationalization

Step 5

Rationalizati
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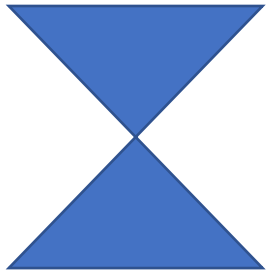
A balance must be achieved here that provides a solution that is best for all the elements described. It will not be possible to satisfy all of the requirements.



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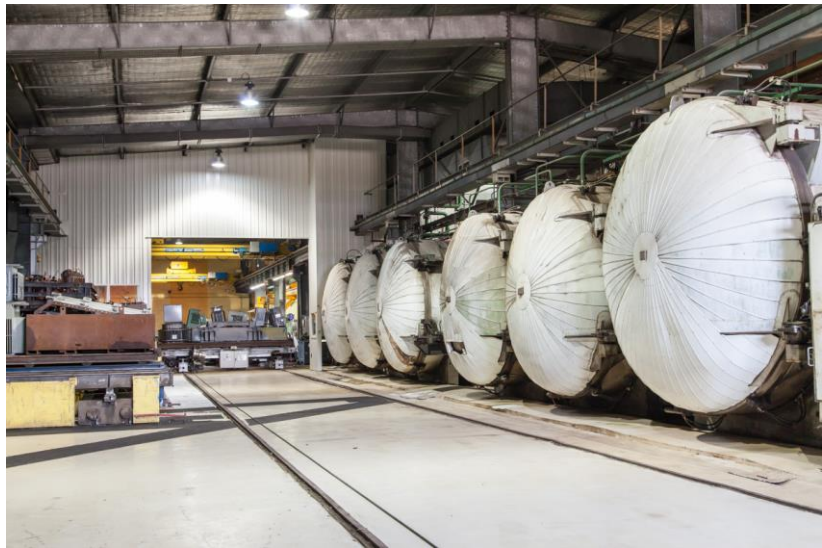
5. Rationalization

Step 6

Implementation

- Now the elimination strategy need to be implemented in an environmentally sound manner.
- Calls for bits for the contractors for example for decontamination, destruction, transport and recycling
- Close the PCB management cycle



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Thank you for your attention !

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