

Global and Regional Experiences and Best Practices for the Environmentally Sound Management of PCBs

Harnessing Inventory to Make the Legacy PCB Visible: A Scalable Approach from Indonesia Experience

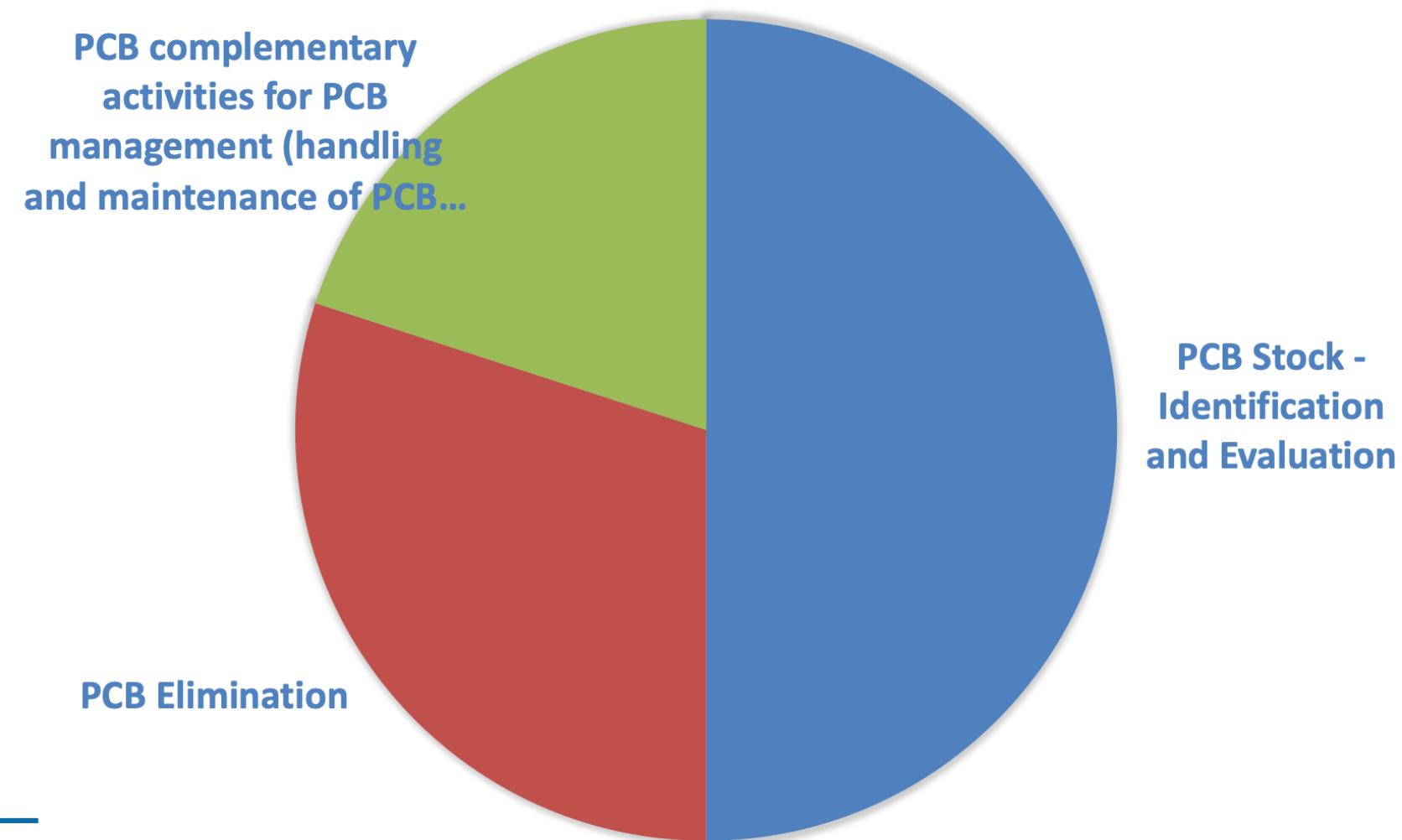
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Presented at the Webinar "Making Visible the Legacy of Polychlorinated Biphenyls (PCBs): A Regional Webinar – Asia" co-organized by the Secretariat of the Basel, Rotterdam, and Stockholm Conventions (BRS) and the United Nations Institute for Training and Research (UNITAR) on 30 September 2025

PCB Inventory: The Critical Stage

The “most” and the “prerequisite”!

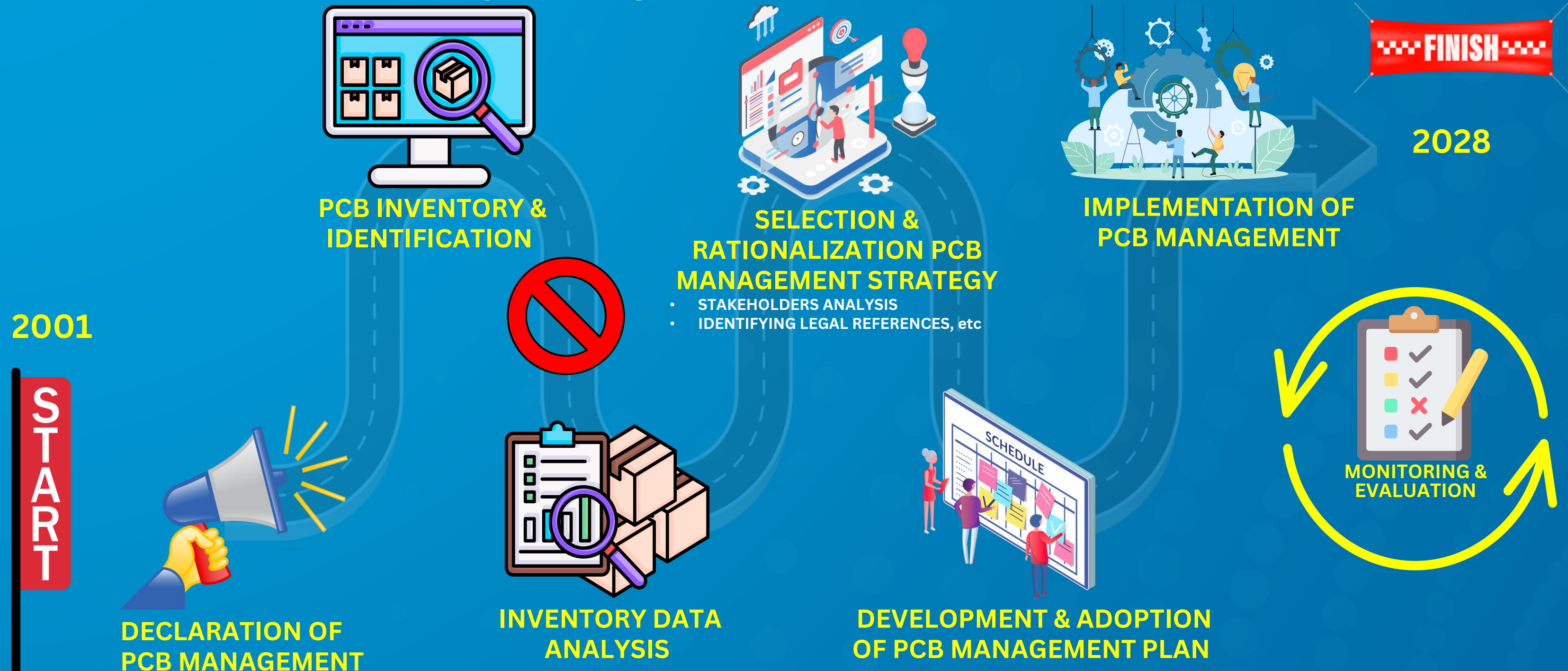
Phases of PCB Environmentally Sound Management



PCB Inventory &
Identification:
50% of all activities!

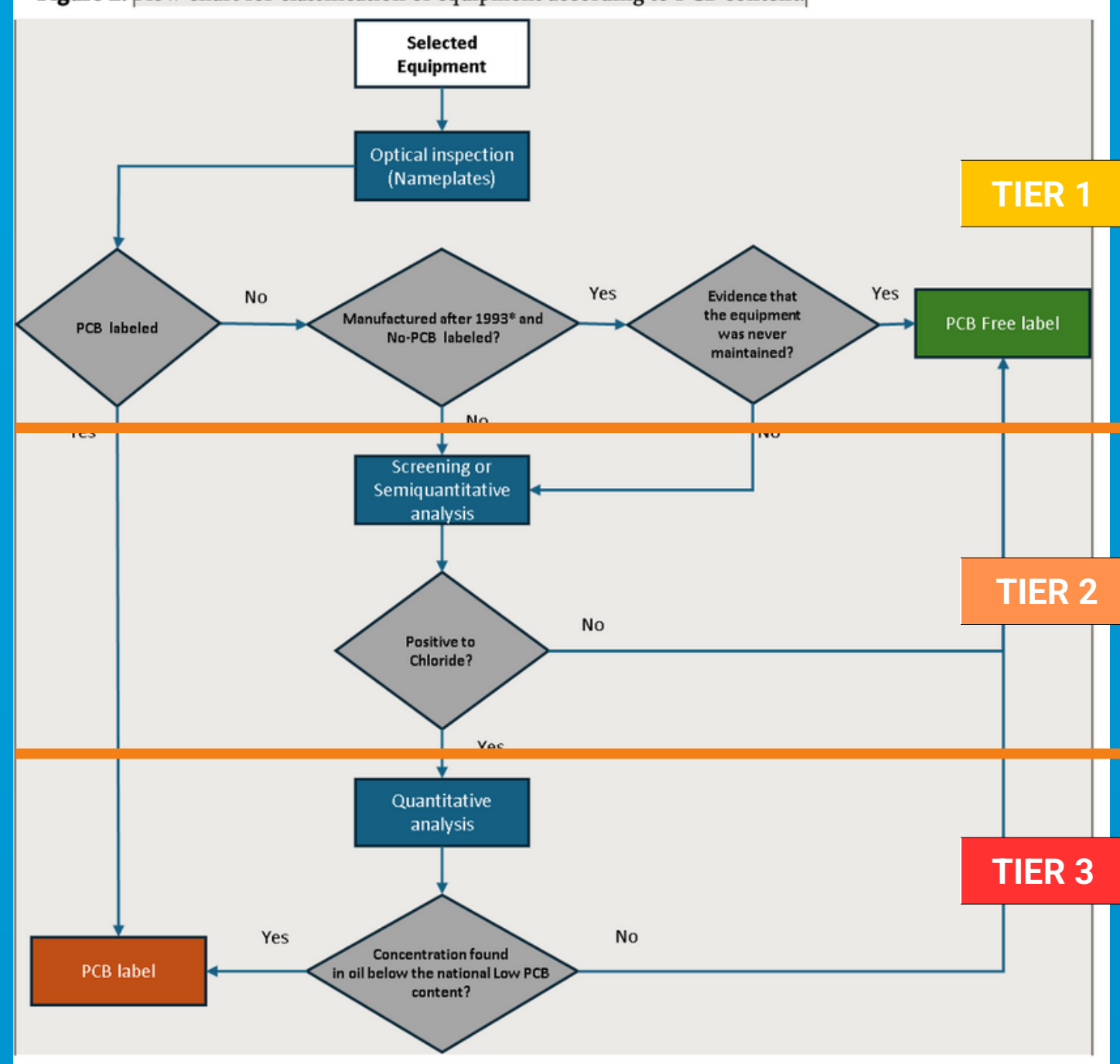
PCB Inventory: The Critical Stage

The “most” and the “prerequisite”!



PCB Inventory: The Critical Stage

Figure 2. Flow chart for classification of equipment according to PCB content.



Modified from: UNEP, 2025. Revised guidance for the development of polychlorinated biphenyls (PCB) inventories and determination of PCB content (UNEP/POPS/COP.12/INF/10)

TIER 1: Field Data Collection & Visual Inspection (Visual Test)

Visual Test: the presence of PCB

- Several Criteria and Indicators: *the more they fit, the more they tell the possibility of PCB presence*

NOT STANDARDIZED → BIAS!

TIER 2: portable and rapid test kit
STANDARDIZED!

“and/or” conditions TIER 1!

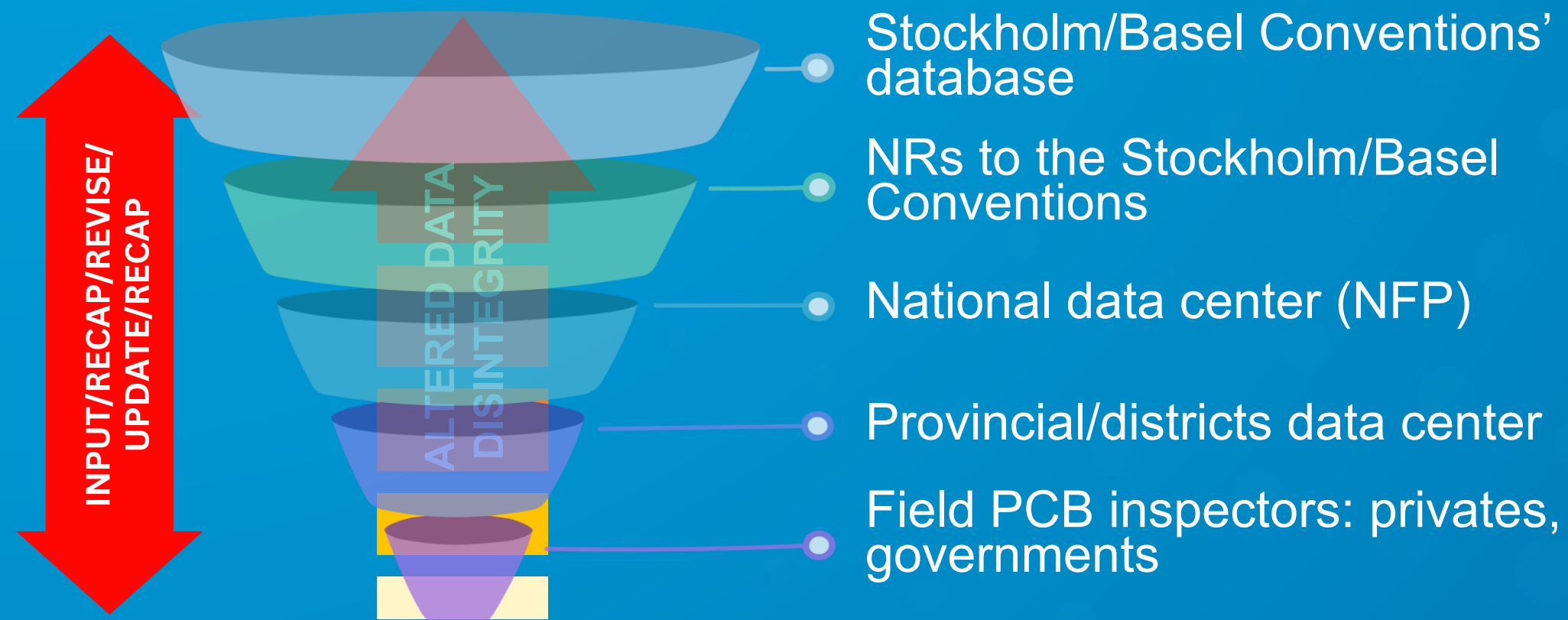
TIER 3: GC-ECD (ASTM/IEC/, etc....)
STANDARDIZED!

→ ALTERED ERROR= The Butterfly Effect!

PCB Inventory: The Challenge

PCB Inventory “Butterfly Effect”:

“One personal error/bias altered into an emerging low global data integrity”



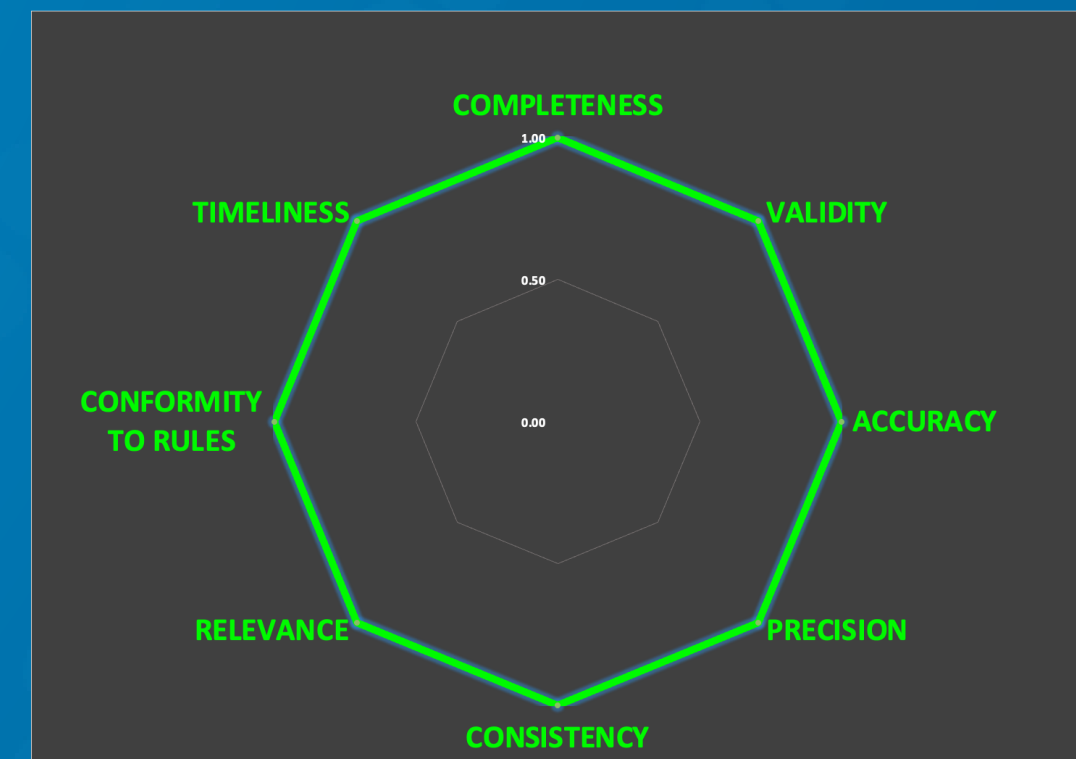
An illustration of altered low quality/ integrity of PCB inventory database

Issue of Validity/Provability:

Governments' lack of capacity to validate and/or challenge self-inventoried Tier 1 results performed by industries

TIER 1 PCB Inventory: Keeping data Integrity!

- What sources of data and which collection methods?
- What criteria & indicators (C&I) for visual test
- What is the procedures to interpret combinations of C&I?



An illustration of data integrity



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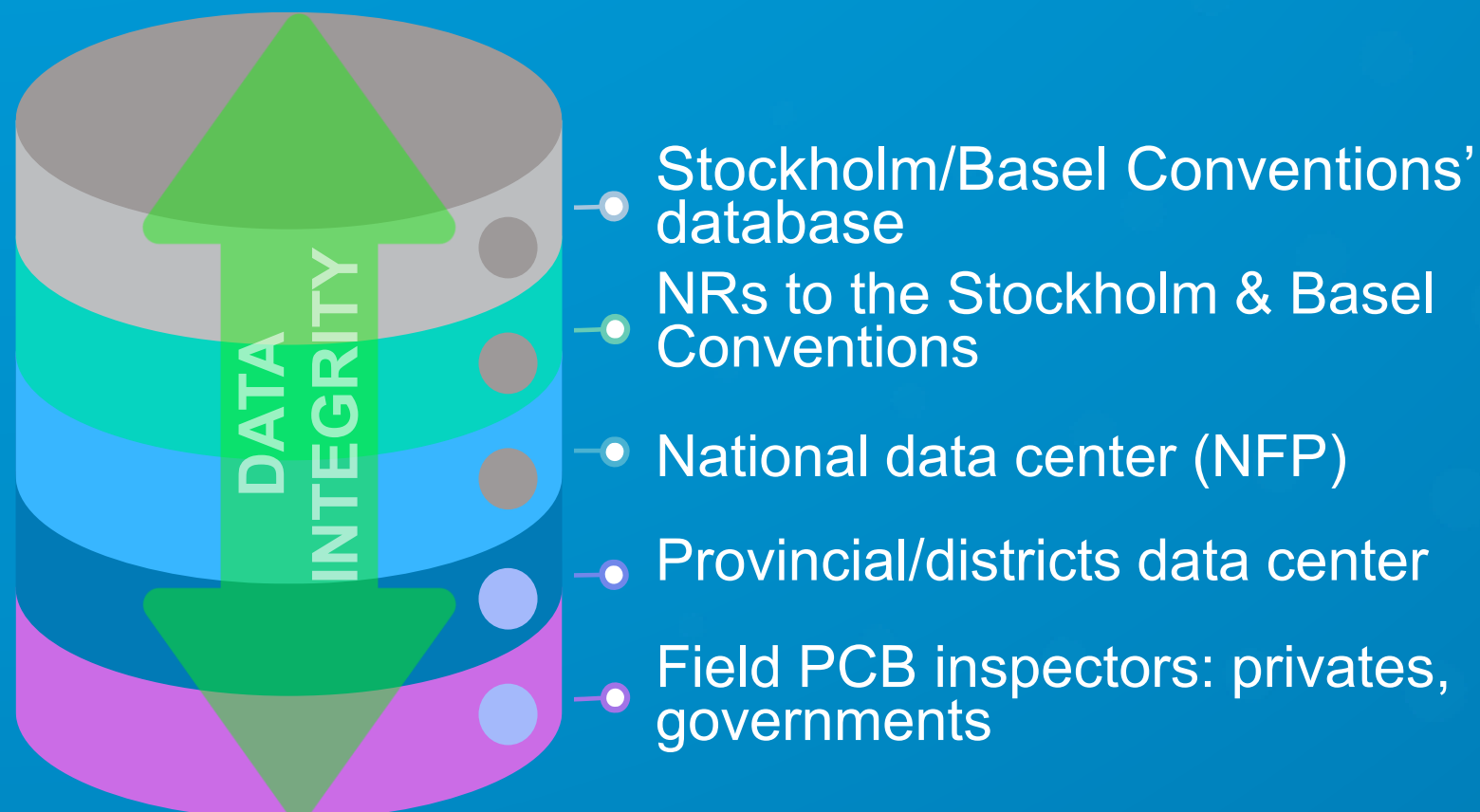
Harnessing PCB Inventory: PCB-MIS

PCB Management Information System:

“A digital platform designed to record, store, analyze data and information, advise strategy and track/monitor PCB management implementation throughout its lifecycle: from inventory to disposal (cradle-to-grave)”



An illustration of PCB-MIS



An illustration of how PCB-MIS preserves data integrity

Expert Rule-based System (“Classical” AI):

“Encodes the knowledge and logical reasoning of PCB experts into a set of automated rules and procedures for inventory data collection and visual test, minimize bias & subjective errors”

PCB-MIS consists of:

- Sub-Platform 1: “Lacak (Track) PCBs!”
- Sub-Platform 2: “Pantau (Monitor) PCBs!”

Harnessing PCB Inventory: PCB-MIS

Sub-Platform 1: Lacak (Track) PCBs!

PCB Inventory Form+++

- ✓ Intelligent digital form, adapt to inventory's object
- ✓ Engineer to enforce data integrity: compliance to 8 parameters
- ✓ Lively connection, multiple users working simultaneously without conflicts

“Renders reliability, consistency, validity (provability/traceability) of data and results!”



Picture: courtesy of PT PPLi



Picture: courtesy of PT Pertamina Hulu Energi Persero



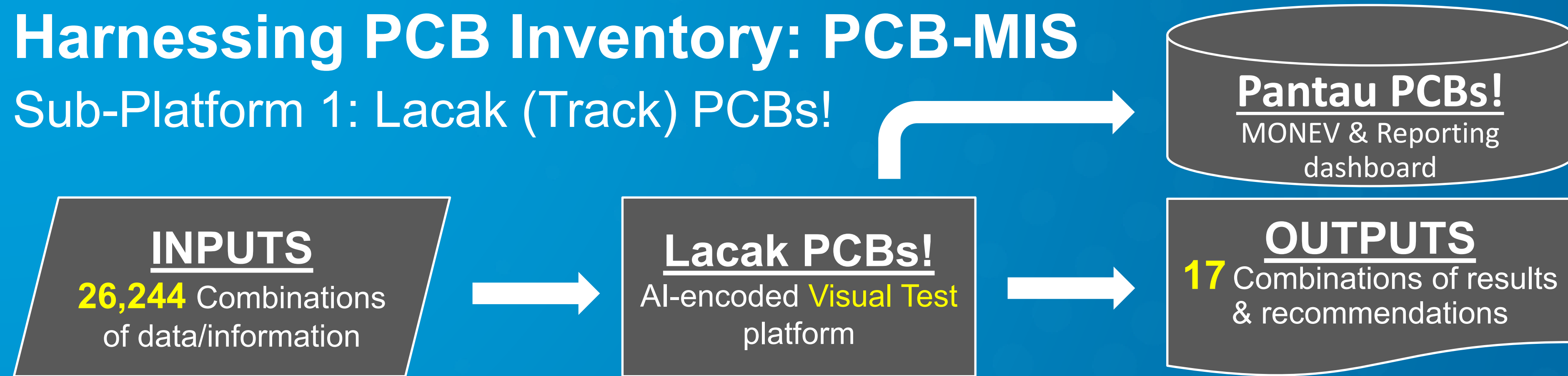
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Harnessing PCB Inventory: PCB-MIS

Sub-Platform 1: Lacak (Track) PCBs!



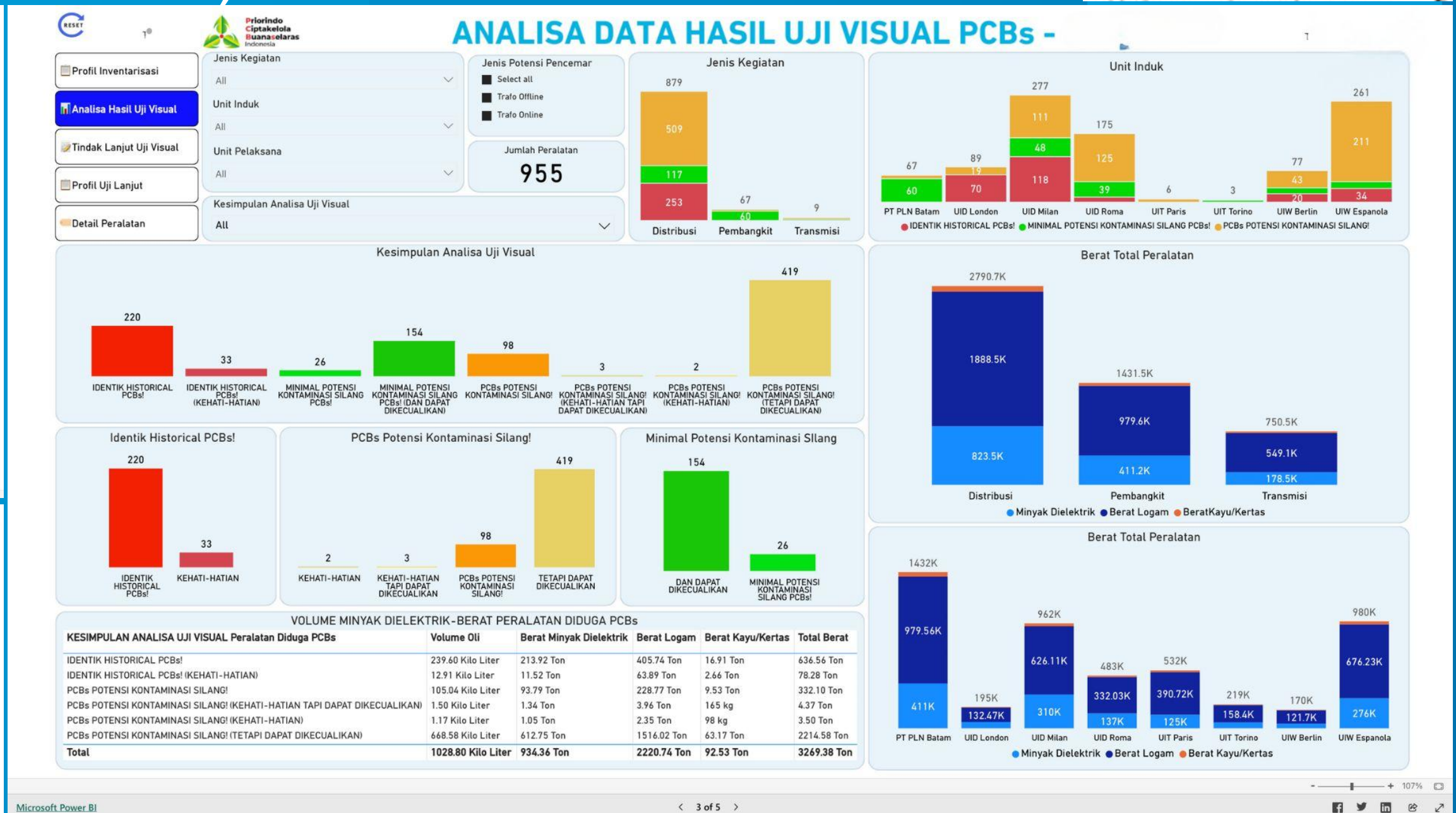
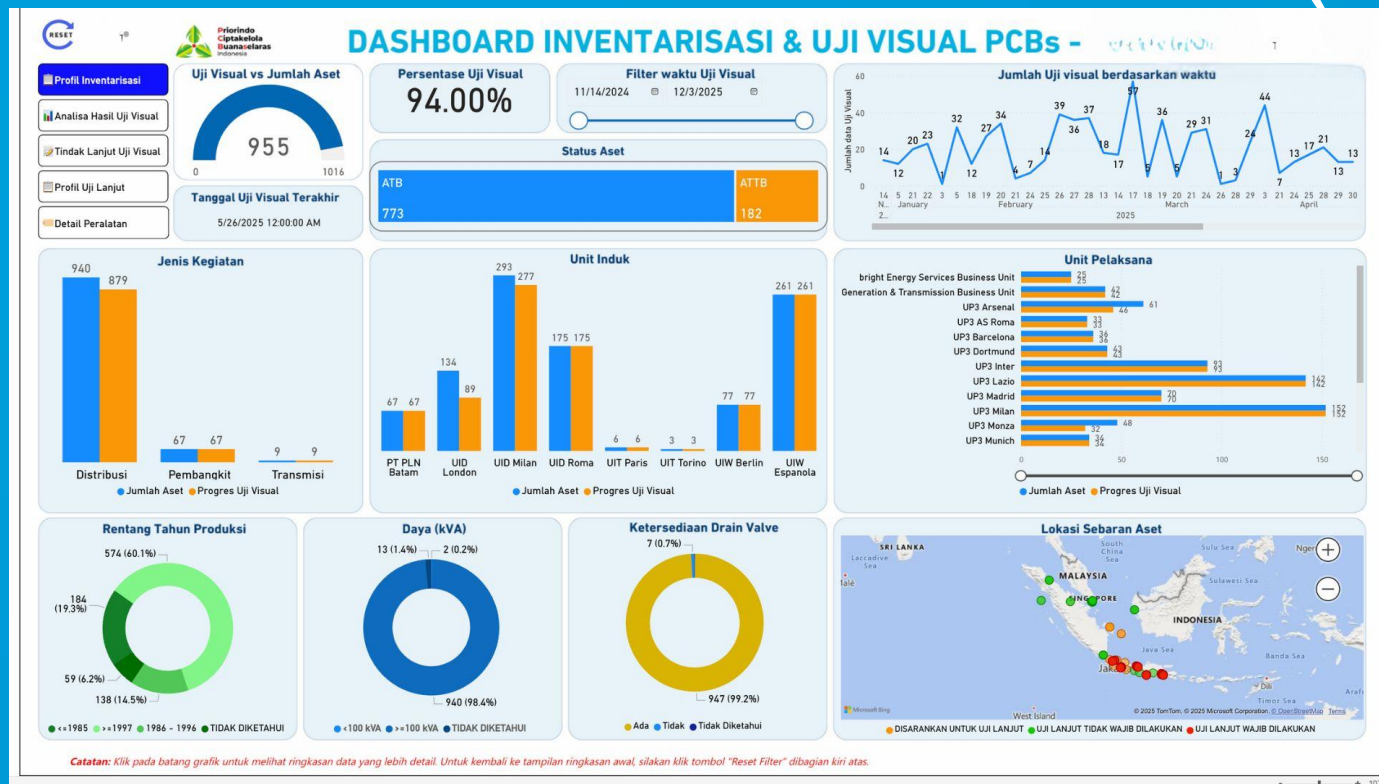
Reducing 26,244 → 17 combinations ≈ 99.36% uncertainty!

CONCLUSIONS (1)	PROMPTS (2)	RECOMMENDATIONS (3) / TIER TEST (4) PRIORITY (5)
Identical to manufactured PCB transformers	Indicative or Precautionary	Mandatory PCB test / Tier 3 method / Critical
Potentially cross-contaminated transformers		Mandatory PCB test / Tier 2 and/or Tier 3 / Urgent
Minimum risk of cross-contamination	Indicative	PCB test is not mandatory / No Tier / Not urgent

Example of main conclusions and recommendations auto-generated by Lacak PCBs! for transformers

Harnessing PCB Inventory: PCB-MIS

Sub-Platform 2: Pantau (Monitor) PCBs!



The monitoring dashboard of Pantau PCBs! through quantity and quality of PCB problems are visualized and located (Picture: courtesy of Kelola PCBs)

Harnessing PCB Inventory: PCB-MIS

Improved visibility means better planning!



Picture: courtesy of PT Pertamina Hulu Energi Persero

Develop management strategy (i.e. sampling scenario) to meet their specific “PCB profile”, needs, resources, risks, etc.

Transforming Regional/Global PCB Inventory

A strategic scalable approach through PCB-MIS

UPSCALING	POTENTIAL BENEFITS
NATIONAL & REGIONAL	• <u>Harmonized PCB Inventory Data:</u> Enables comparison and collaboration between countries within a region. • <u>Development of National Actions & Regional Strategy/Cooperation:</u> Allows for the development of coordinated PCB management strategies (e.g., shared technical capacities for PCB analysis, disposal, etc). • <u>Enhance Regional PCB Governance and Policy Coherence:</u> Regions can collaborate to eliminate reduce regional transboundary PCB risks. • <u>Creating a Regional Market for Services:</u> A transparent regional inventory attracts competitive services within the region, rather than relying on expensive international options.

Transforming Regional/Global PCB Inventory

A strategic scalable approach through PCB-MIS

UPSCALING	POTENTIAL BENEFITS
GLOBAL	• <u>Eliminating/Reducing of Data Gaps:</u> Potentially reduces non-reporting and provides realtime and more reliable global dataset on PCB stocks and wastes. • <u>Evidence-Based Policy:</u> Allows COP and expert committees to make decisions based on more realiable accurate data. • <u>Tracking Progress Transparently:</u> Provides a real-time, transparent dashboard for monitoring global progress towards the 2025/2028 goals. • <u>Resource Optimization:</u> Helps international bodies (donors and implementing agencies) direct funding to where they are most needed, based on reliable data and capacity risks (coupled with results from global assessment). • <u>Strengthened Conventions:</u> Enhances the effectiveness and credibility of the Stockholm & Basel Conventions by rooting a long-standing data integrity problem.

Conclusions

- A reliable and standardize PCB inventory, esp. the Tier 1, is a foundational step to improve PCB management capacity towards successful phasing-out and elimination at country, regional and global scales.
- PCB-MIS is a powerful tool to make the legacy PCB “visible” through harnessed inventory by directly addressing the root causes (low quality/integrity of PCB inventory data at field/local-scale).
- Upscaling PCB-MIS to the regional and global scales shall provide a blueprint for a larger and cross-scales collaboration to address the 2025/2028 goals.

THANKS! TERIMA KASIH!

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Environmentally Sound Management of PCBs**

**Harnessing Inventory to Make the Legacy PCB Visible: A Scalable Approach
from National Experience**

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