



SEAGATE

# HDD Circularity

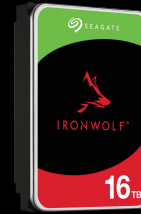
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# Agenda

- 01 Introduction
- 02 Circularity Pathways
- 03 HDD Circularity
- 04 Summary

# Introduction



## Seagate's Global Presence



- Storage solution provider
- ~\$8B revenue
- Global markets
- Vertically Integrated
- Supply chain largely based in SEA and China



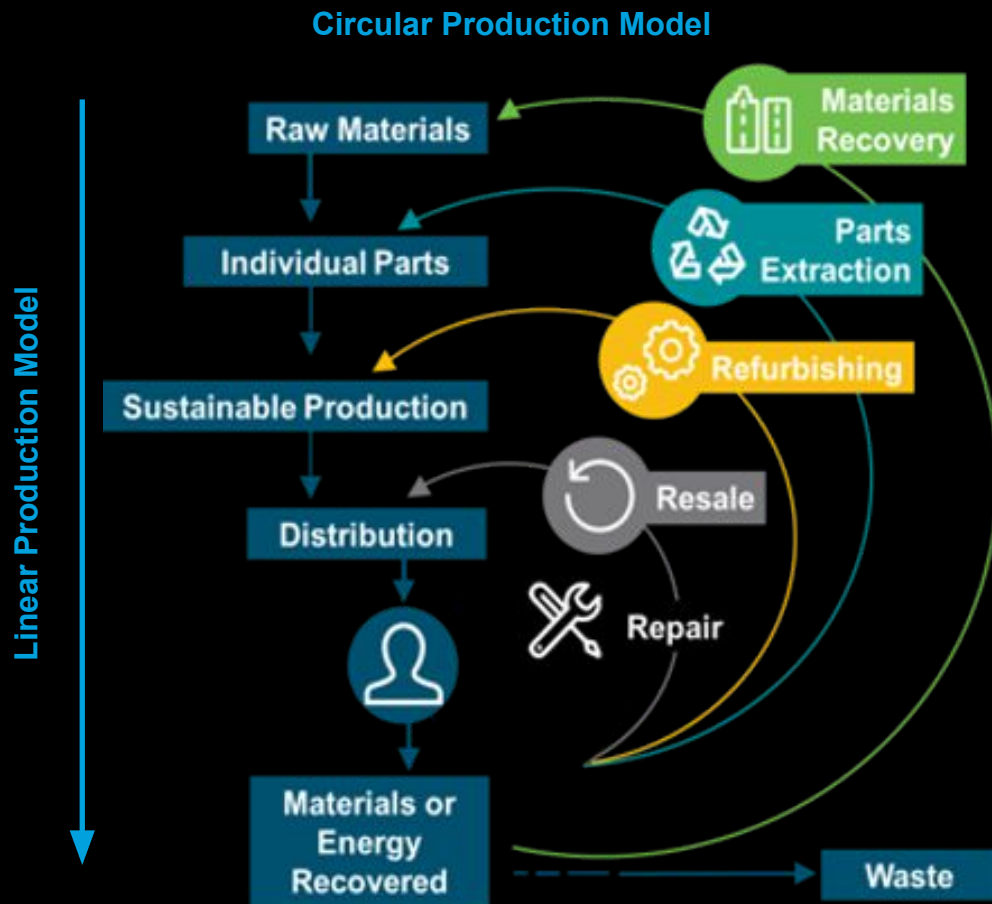
## We Are Sustainability Driven

As a vertically integrated organization that produces data storage technology and infrastructure solutions with seven different manufacturing sites around the world, Seagate recognizes that we must responsibly address the environmental impacts created by our business.

We remain committed to our Science Based Targets and are making meaningful progress towards our Environmental Moonshot Goals. Our values of integrity and innovation drive our priorities: lowering greenhouse gas (GHG) emissions in our operations, designing our products to use less of the earth's finite resources, and **expanding product circularity**.

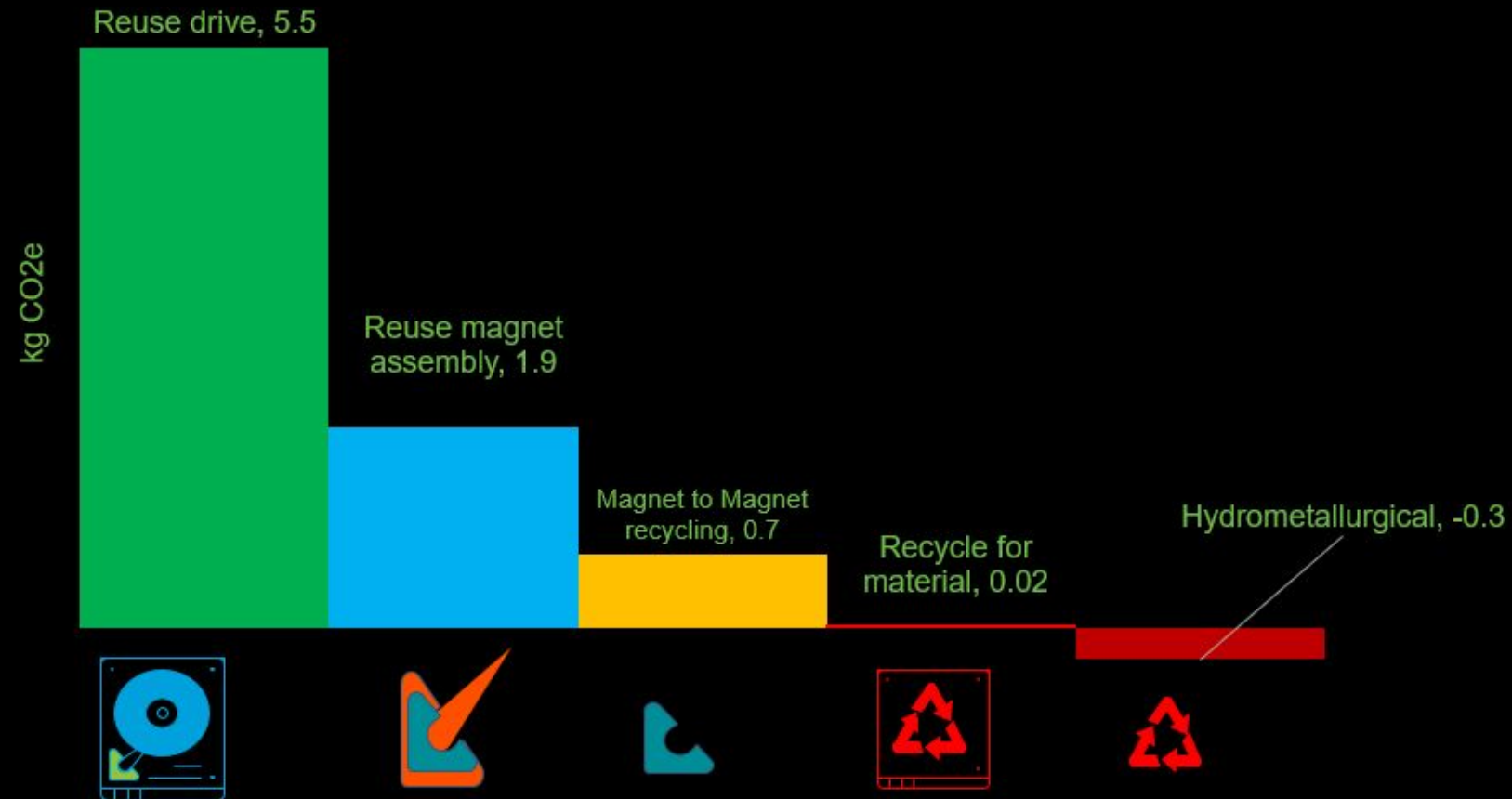


# Circularity Pathway



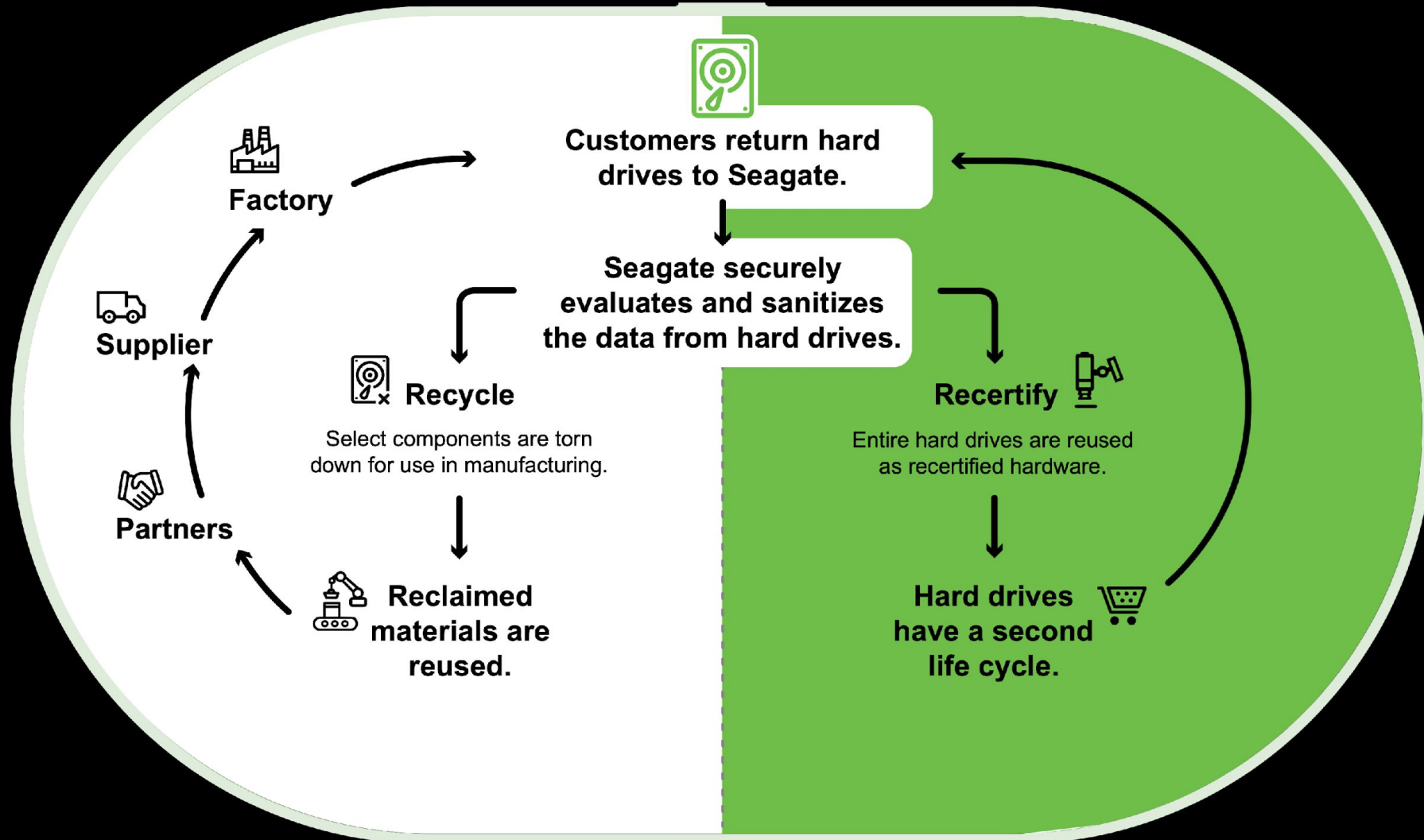
- Various pathway solutions have been established to meet various scenarios
- Extending the life of the drive (Repair) in the field has the highest environmental and economic benefit and the benefits reduces when we move to the outer pathways
- HDD has 61 elements including rare earth and precious metals

# Impact of VCMA (Magnet) Circularity Pathway

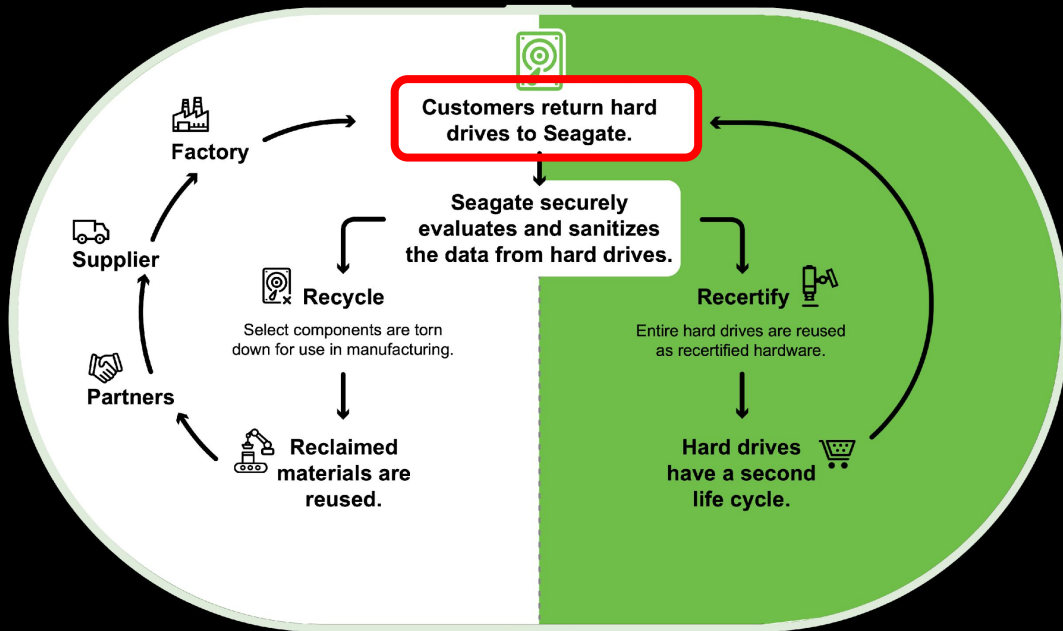


Jin, H., Frost, K., Sousa, I., Ghaderi, H., Bevan, A., Zakotnik, M. and Handwerker, C., 2020. [Life cycle assessment of emerging technologies on value recovery from hard disk drives](#). *Resources, Conservation and Recycling*, 157, p.104781.

# HDD Circularity



# HDD Circularity – 1<sup>st</sup> User



- **Data Security**

**Challenge** : The concern on data security and the effectiveness of data sanitization is a hurdle

**Action** : The development in data sanitization, IEEE 2886 standard – data purge and using crypto erase

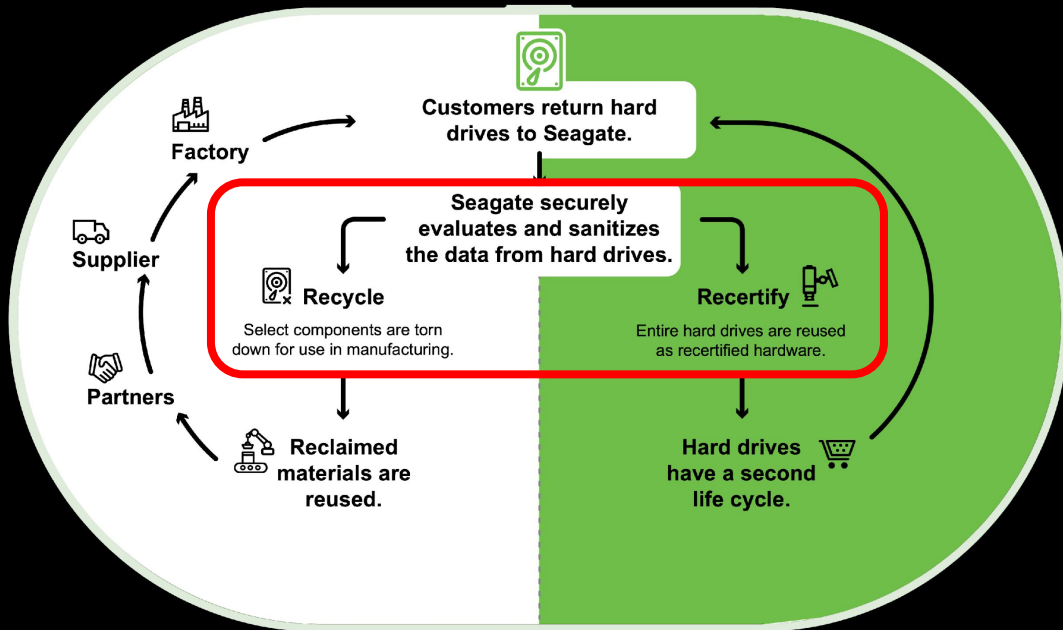
- **Incentives**

**Challenge** : There is no carbon incentive for the 1<sup>st</sup> user to support extending the life of the drive

**Need** : The establishment of a methodology to allocate embodied carbon between the 1<sup>st</sup> and 2<sup>nd</sup> user to incentivize the 1<sup>st</sup> user to support circularity



# HDD Circularity – Material Transfer



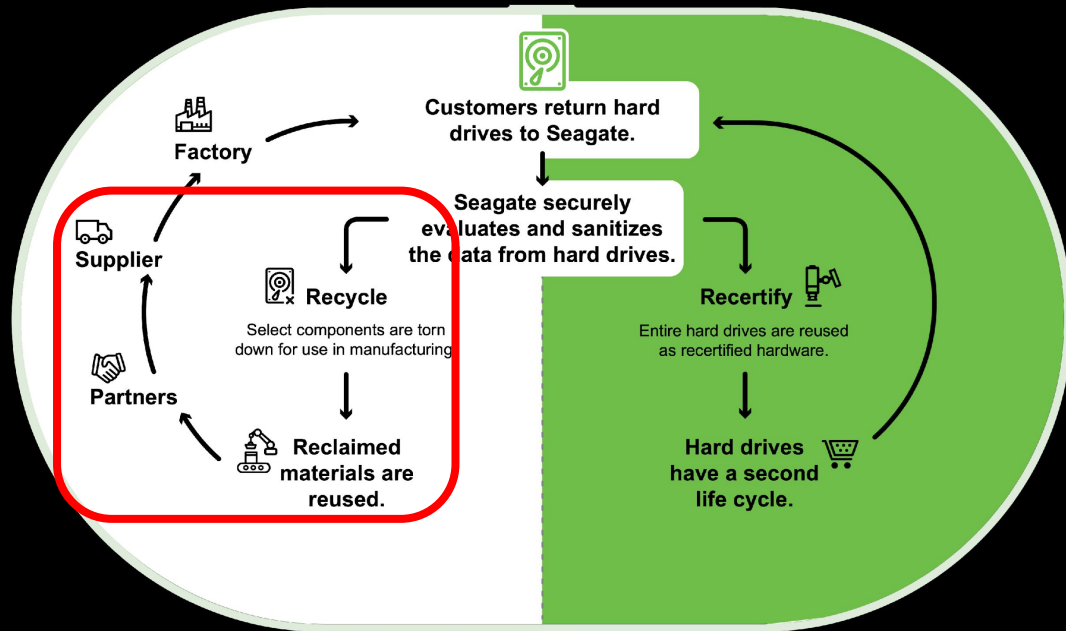
- **Classification of Material**

- **Challenge :**

- No suitable classification of end of 1<sup>st</sup> life material for circularity
    - Material has economic value
    - Classification of material as E-waste is inappropriate
    - Special approval for each shipment is not scalable

**Need :** The establishment of a legislative framework to classify material with economic value for circularity to enable cross border transfer of material with controls to ensure ethical practices

# HDD Circularity – Reuse / Recycling of Components



- **Reuse**

- **Challenge :**

- Changes in technology and form factors

- **Action :** Eco-Design consideration in the design of product for circularity

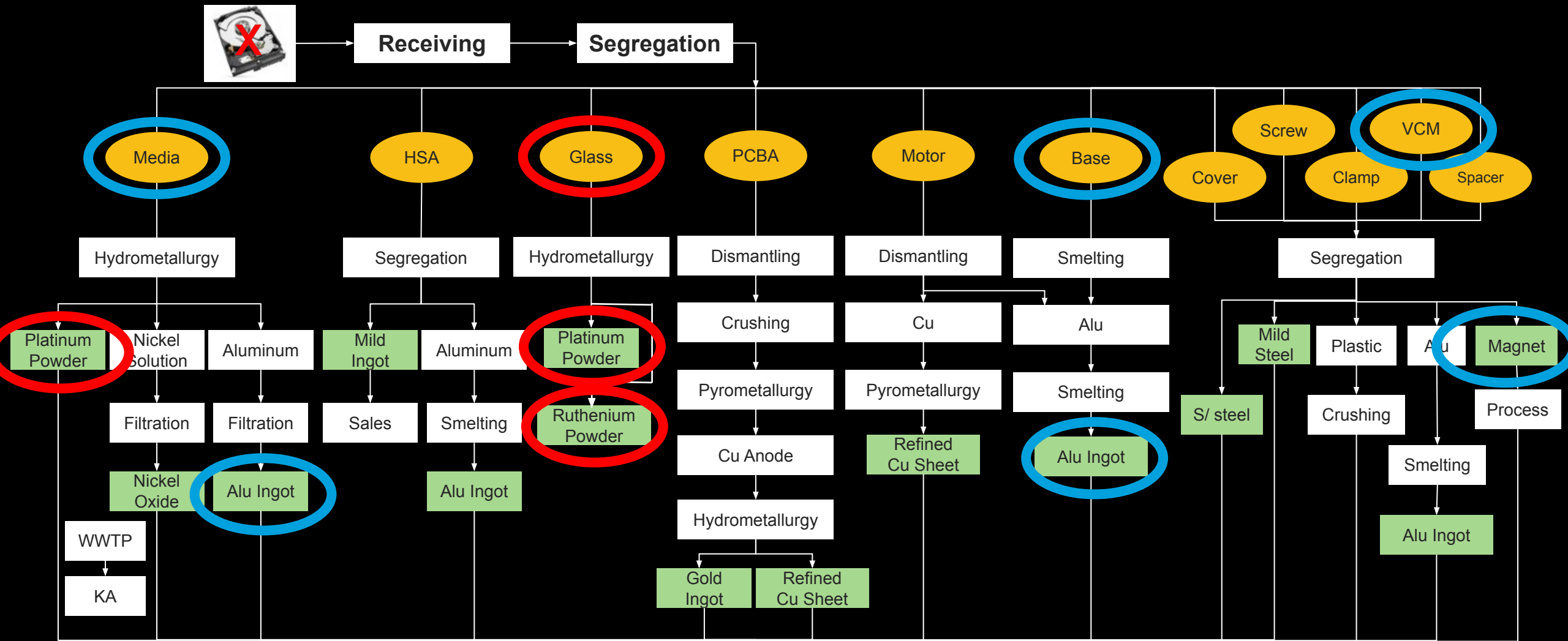
- **Recycling**



- **Challenge :**

- Regulatory
    - Logistics
    - Technology
    - Cost

- **Need / Action :** Setting up a regional supply chain eco-system to support Circularity

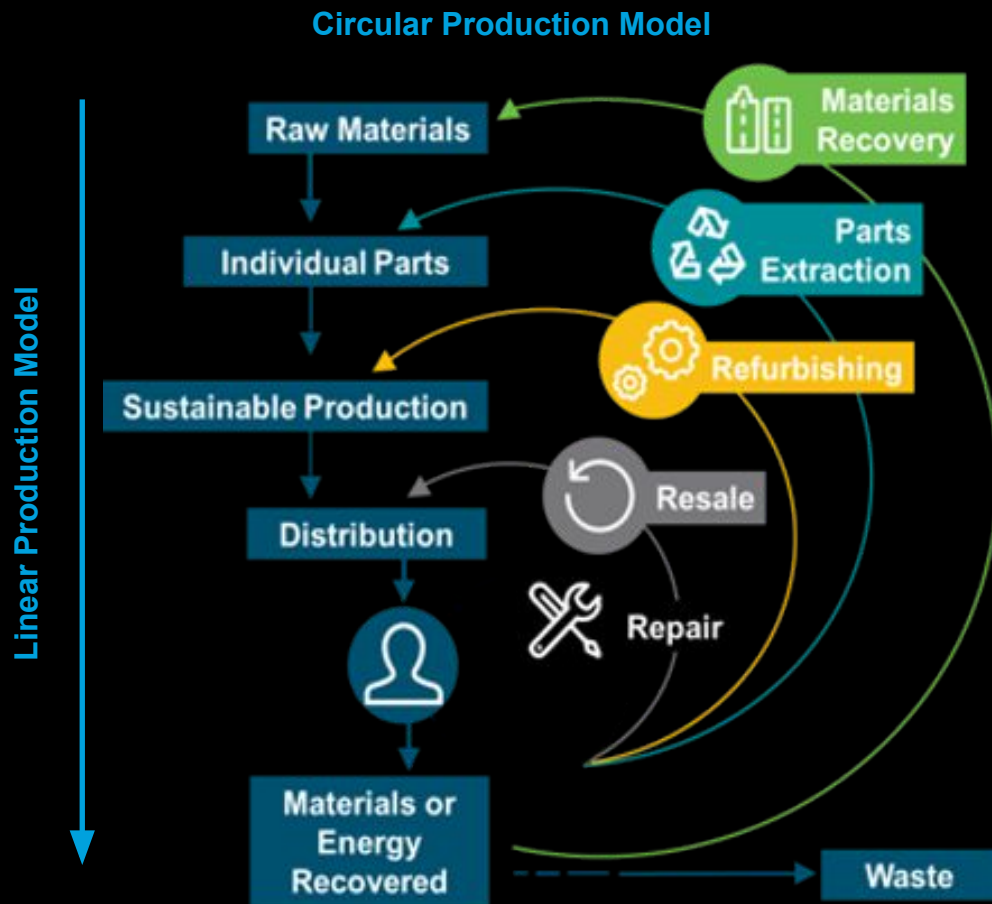
# Tear Down and Reclaim Process for End-of-Life HDDs



-  Circular pathway established
-  Circular pathway under evaluation

**Raw Materials, Metals for Sales**

# Circularity – Progress



## Material Recovery :

Aluminum ~ 170 tons

Magnets ~ 6 tons (2 tons RE oxides)

## Parts Extraction :

Proof of Concept completed for,

- VCMA
- PCBA

## Resale :

- ~ 8 million recertified HDDs placed back in the market

# Summary

- Establishment of a legislative framework to classify material with economic value for circularity to enable cross border transfer of material with controls to ensure ethical practices
- Setting up a regional supply chain eco-system to support Circularity
- The establishment of a methodology to allocate embodied carbon between the 1st and 2<sup>nd</sup> user to incentivize the 1<sup>st</sup> user to support circularity

**Thank You**

