



# Cradle to Cradle

A Journey Towards a  
Circular Economy for Data Storage

**Hugo Bergmann**

*Senior Product Marketing Manager*

*Seagate Technologies*

A hand is holding a silver Seagate hard drive. The drive has a circular logo in the center and various text labels, including 'SEAGATE', 'Model HD15', '1TB', and 'Product of China'. A warranty label is also visible. The background is dark and out of focus.

# The current state of storage security...

# **“We shred everything”**

# A Sustainable Datasphere Requires a New Mindset

## Today's Widespread HDD Shredding



>200 million drives  
disposed each year



# It takes a change of mindset

Other industries are doing it already.



## Rental Car Companies

Buy new cars. After 40-50,000 km or 1-3 years, car is reconditioned and resold. It's then driven another 10-15 years before being recycled.



## Compare with Data Centers Today

Buy 10,000 HDDs, use for five years, then destroy them. Wouldn't it be great to give them a second life?





# CDI —Circular Drive Initiative

Foster a sustainable future by enabling the circular economy in data storage.

We strive to ensure that data storage devices can be securely reused.

McDONOUGH  
INNOVATION  
DESIGN FOR THE CIRCULAR ECONOMY™

  
**Western Digital**

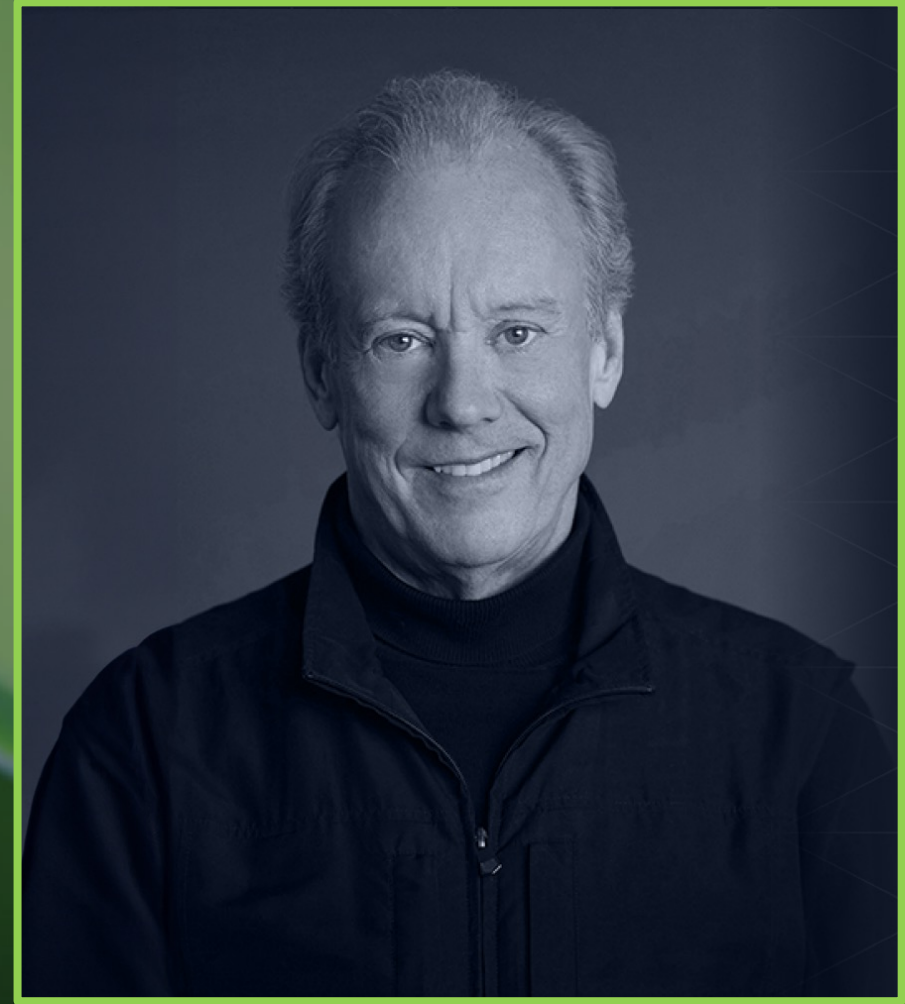
 **SEAGATE**

 **Micron®**

 **chia**

# Partnering with McDonough Innovation

"I love the idea that these storage drives can be repurposed, with new data, wisdom, intelligence, and cleverness to better the human condition. These renewed drives will help us remember the future. Storage reuse effectively demonstrates the Cradle to Cradle Circular Technosphere concept and I believe it can be a leading example in the ICT industry."



**William McDonough**

Chief Executive, McDonough Innovation

# Barriers to a circular economy for storage



## DATA SECURITY, POLICY, AND GOVERNMENT REGULATIONS

Zero risk policies due to large impact of data breaches.



## TRANSPARENCY

around processes, device health and reliability are critical for trust.



## VIBRANT SECONDARY MARKETS

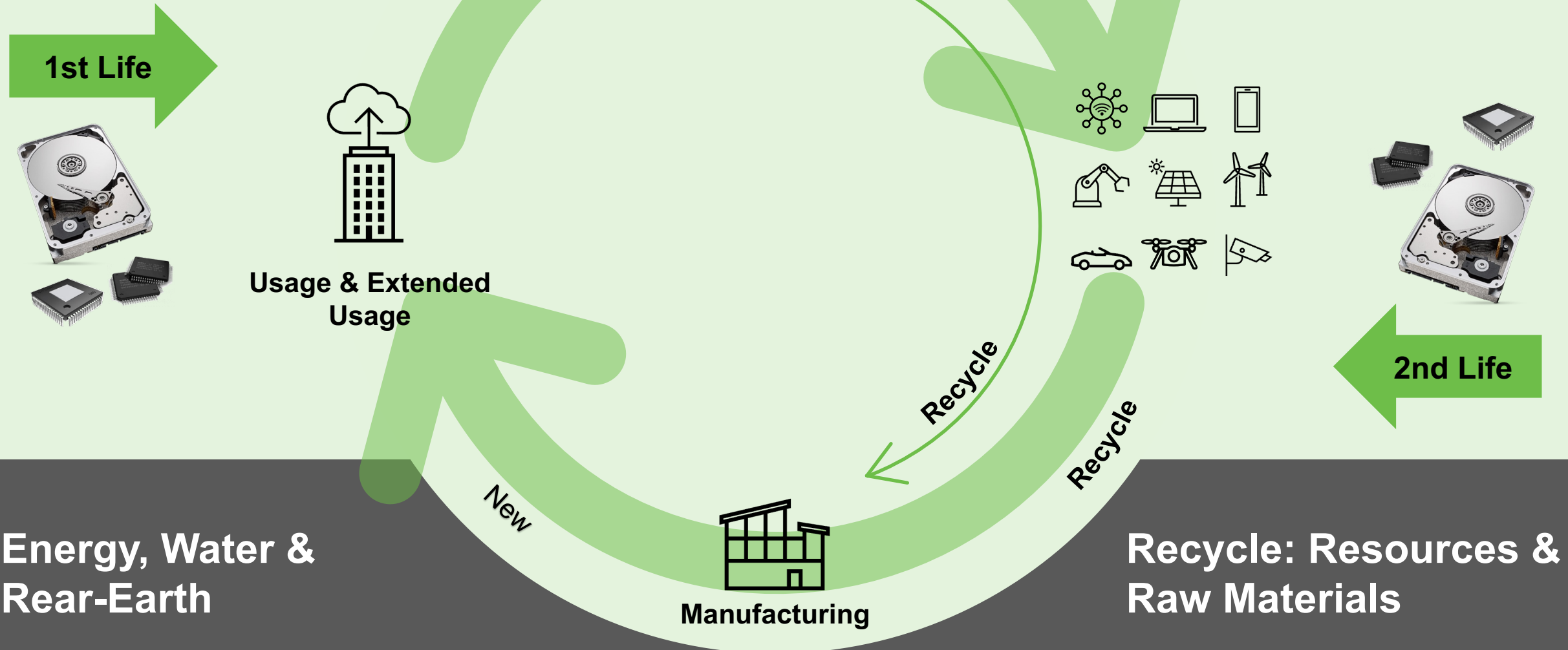
are required to economically reclaim and repurpose used storage devices.



## METRICS

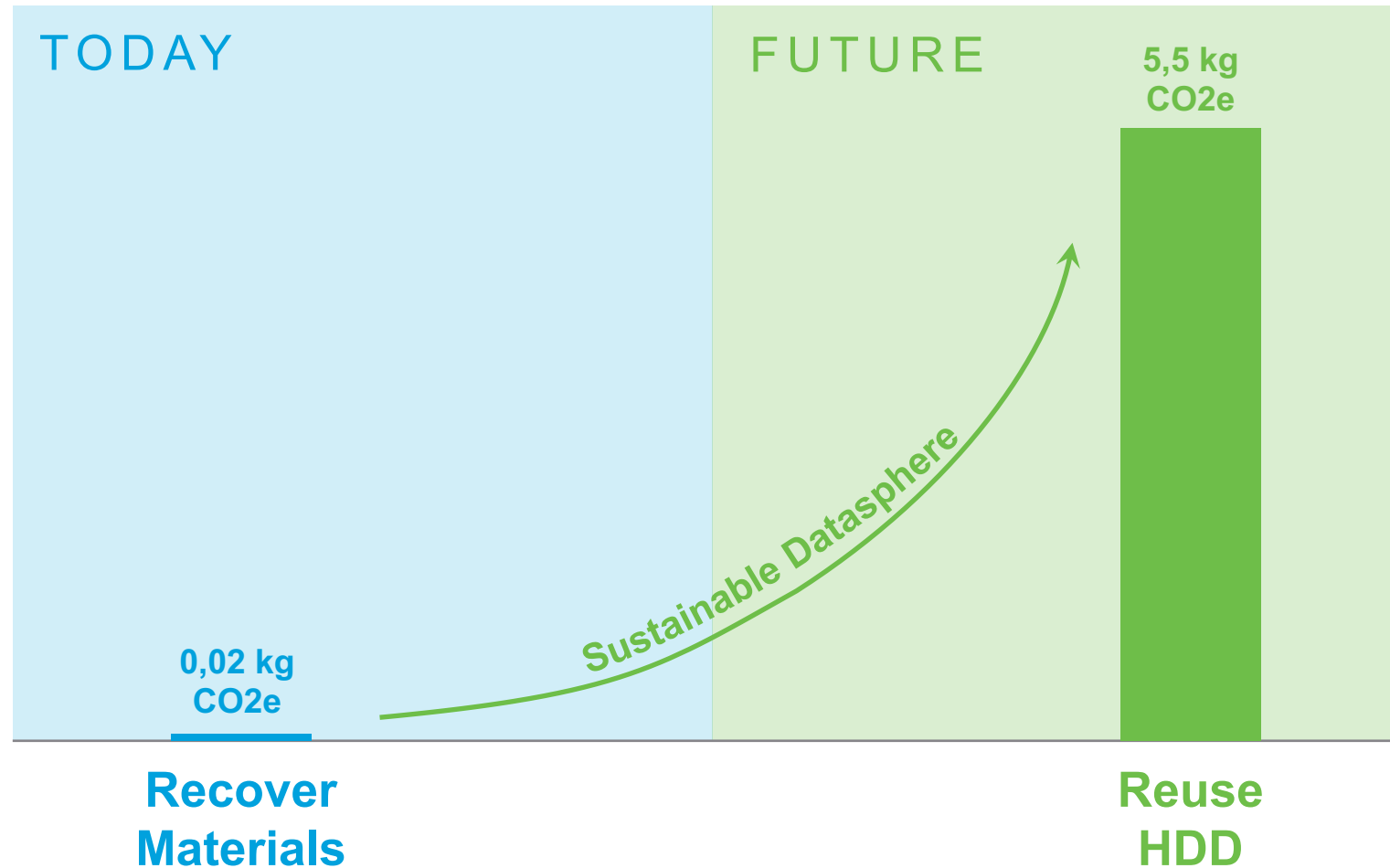
There is a lack of transparency and data availability around product information, environmental impact, carbon accounting for circular business models

# A Practical Circular Economy for Storage





# HDD Reuse: 275× Larger Impact than Recycling



# Reuse is the largest impact for circularity

SSDs have a large amount of embedded carbon from manufacturing!

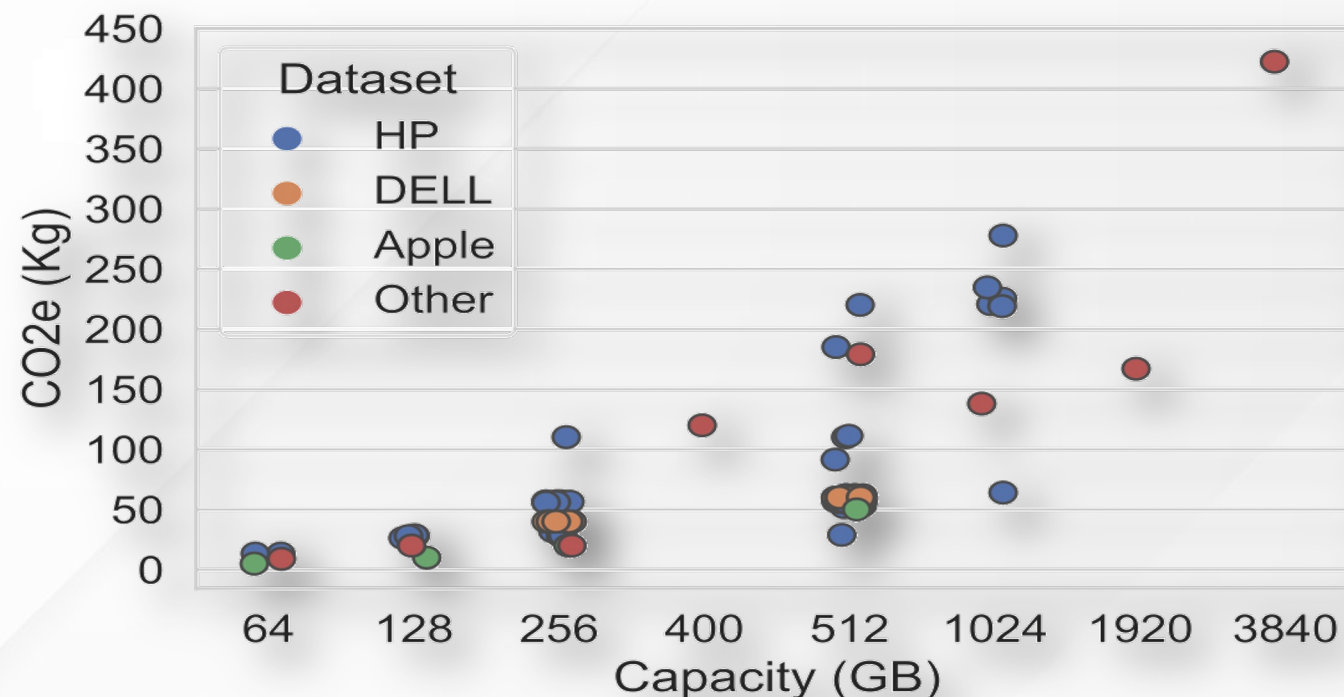


Figure 4: Carbon emissions for manufacturing 94 Solid State Drives, data based on Life Cycle Analysis (LCA) reports published by eight vendors.

# Data Security as a Barrier



**Data leak**



**Trust**



**Privacy**



**Security**



**Encryption**



**Policies  
Minimize Risk**



**Legal  
Agreements**

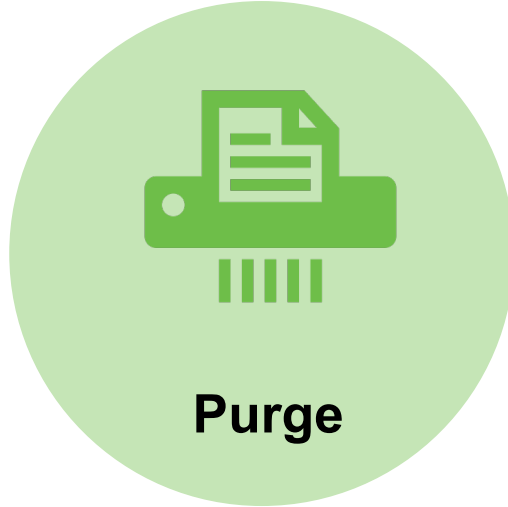
# Data Sanitization Methods



## Clear

Uses logical techniques to remove data on all addressable storage.

Prevents against non-invasive data recovery.



## Purge

Uses logical or physical techniques to remove all data on addressable and non-addressable storage.

Infeasible data recovery with state-of-the-art techniques leaving device in usable state.



## Destruct

Infeasible data recovery with state-of-the-art techniques.

Disintegrate, incinerate, and melt leaving device in unusable state.



# Data Sanitization Standards



NIST SP 800-88R1

ISO/IEC 27040

- Created standards for purge sanitization level
- Purge is a process that renders target data recovery infeasible using state-of-the-art laboratory techniques



IEEE 2883 Standard for Sanitizing

- The IEEE 2883 Standard for Sanitizing Storage, a modernized version of ISO/IEC 27040, published in March 2022

# What is CDI doing?



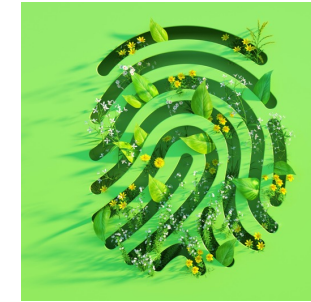
## Develop Sustainable Standards

Make the storage market more sustainable by developing and promoting standards, reporting, and best practices around circular business models.



## Transparency and reporting

Adopt carbon accounting models that show the real impact of circularity



## Rethink the Ecosystem

Enable the broad ecosystem of drive reuse through CDI partners: decommissioning, media sanitization, verification, and sales channels

# CDI Project

## A Comprehensive Grading System for Used Storage Devices

- Transparency required to build trust in secondhand market
- CDI workgroup deep understanding of SSD and HDD quality and reliability
- Grading system designed to accurately assess the health and remaining use left
- Includes endurance, power on hours, errors, device self-test, signed vendor firmware
- Definitions for recertification vs. remanufacturing







**It takes a change of mindset  
and no time to waste**

**Join CDI**