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**BOOSTING THE UPTAKE OF CIRCULAR BUSINESS
MODEL, PRODUCT
AND PROCESS INNOVATION**





**The rising role of
information and AI
and its consequences for our
economic system**

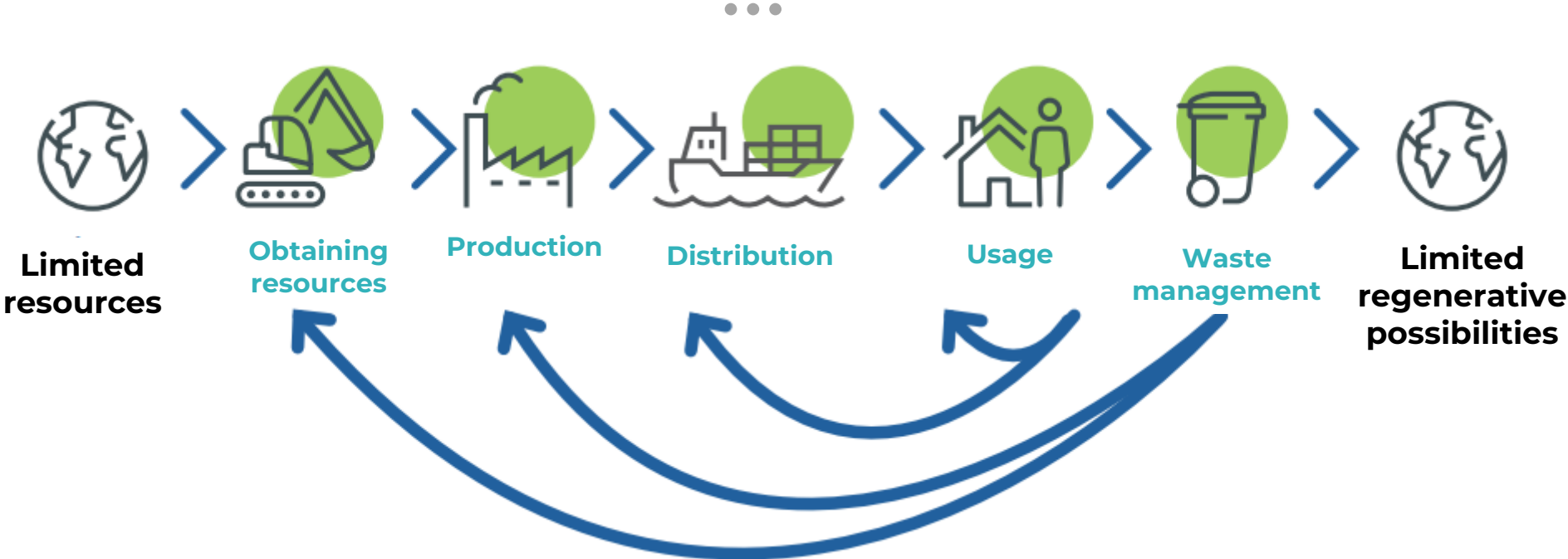
Hubert Bukowski

THE ROLE OF INFORMATION IN A STANDARD LINEAR ECONOMIC SYSTEM WAS MODERATE

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IN AN ECONOMY WHERE RESOURCES SHOULD BE USED NUMEROUS TIMES IN AN EFFICIENT WAY, INFORMATION IS CRUCIAL

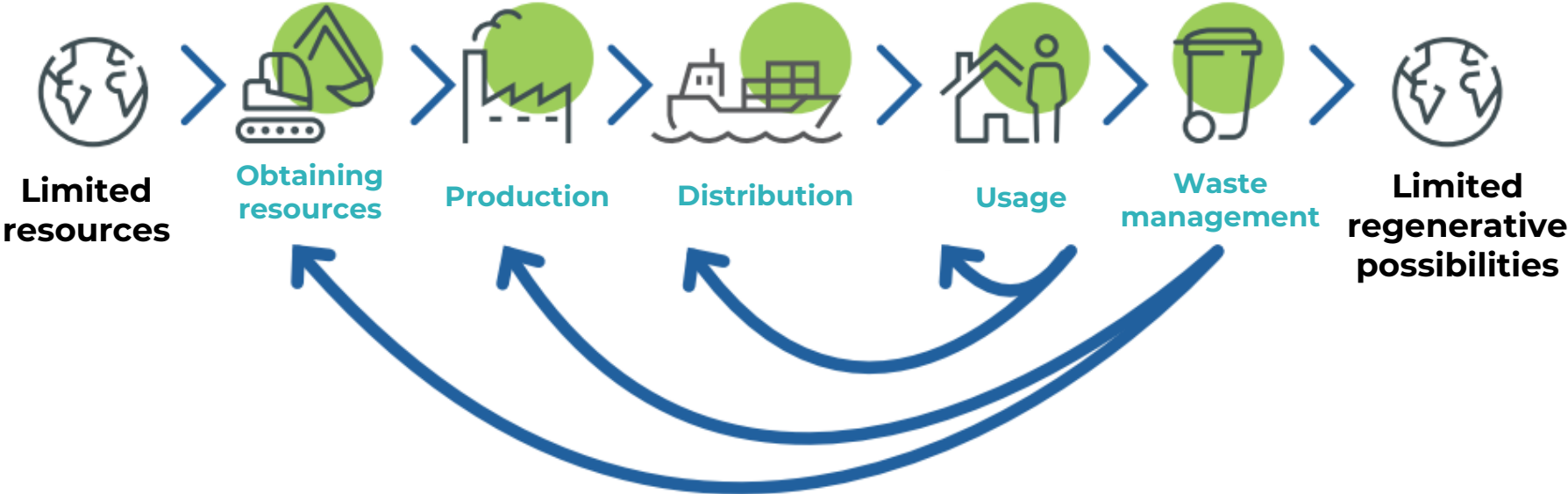


WE NEED DIFFERENT TYPES OF DATA...



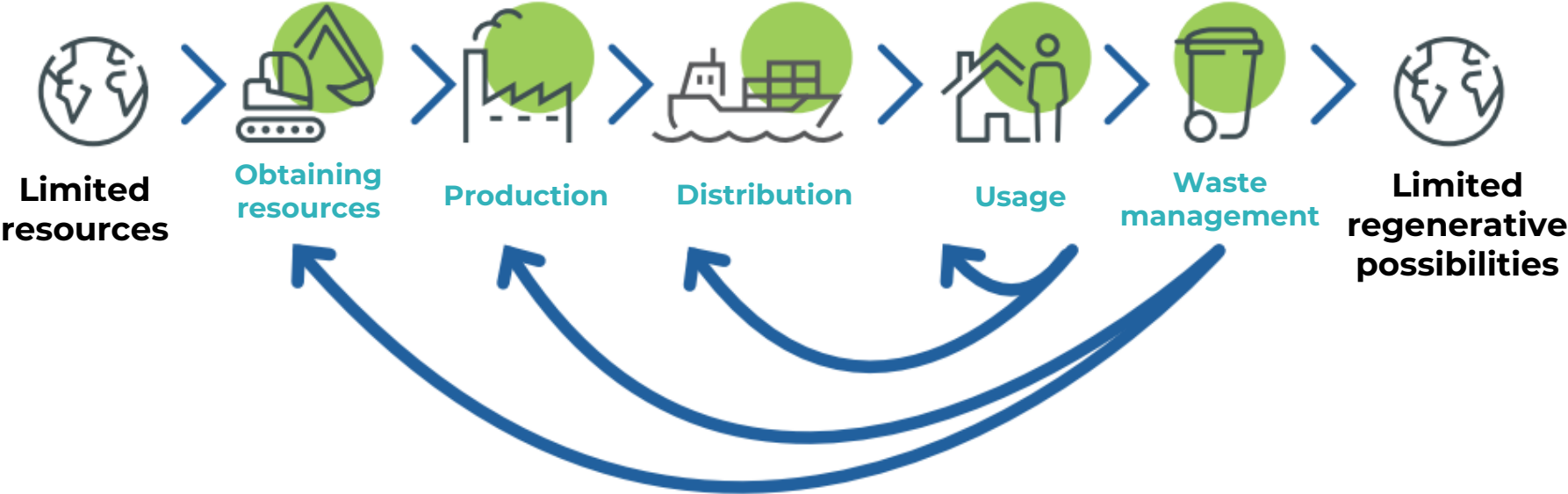
Types of data

- Data on materials and elements needed, their origin and components
- Data on sales, usage, maintenance, decomposition, phases and location of production
- Current location, transport modalities, etc.
- Data on usage, possibility of fixing, origin, components, instructions, etc.
- Data on components, possibility of disassembly, composting possibility etc.



... TO REALIZE VARIOUS BENEFITS

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Being in line with regulations and client demand in regards of the origin and composition of final products

Facilitating ecodesign, production and stock optimization

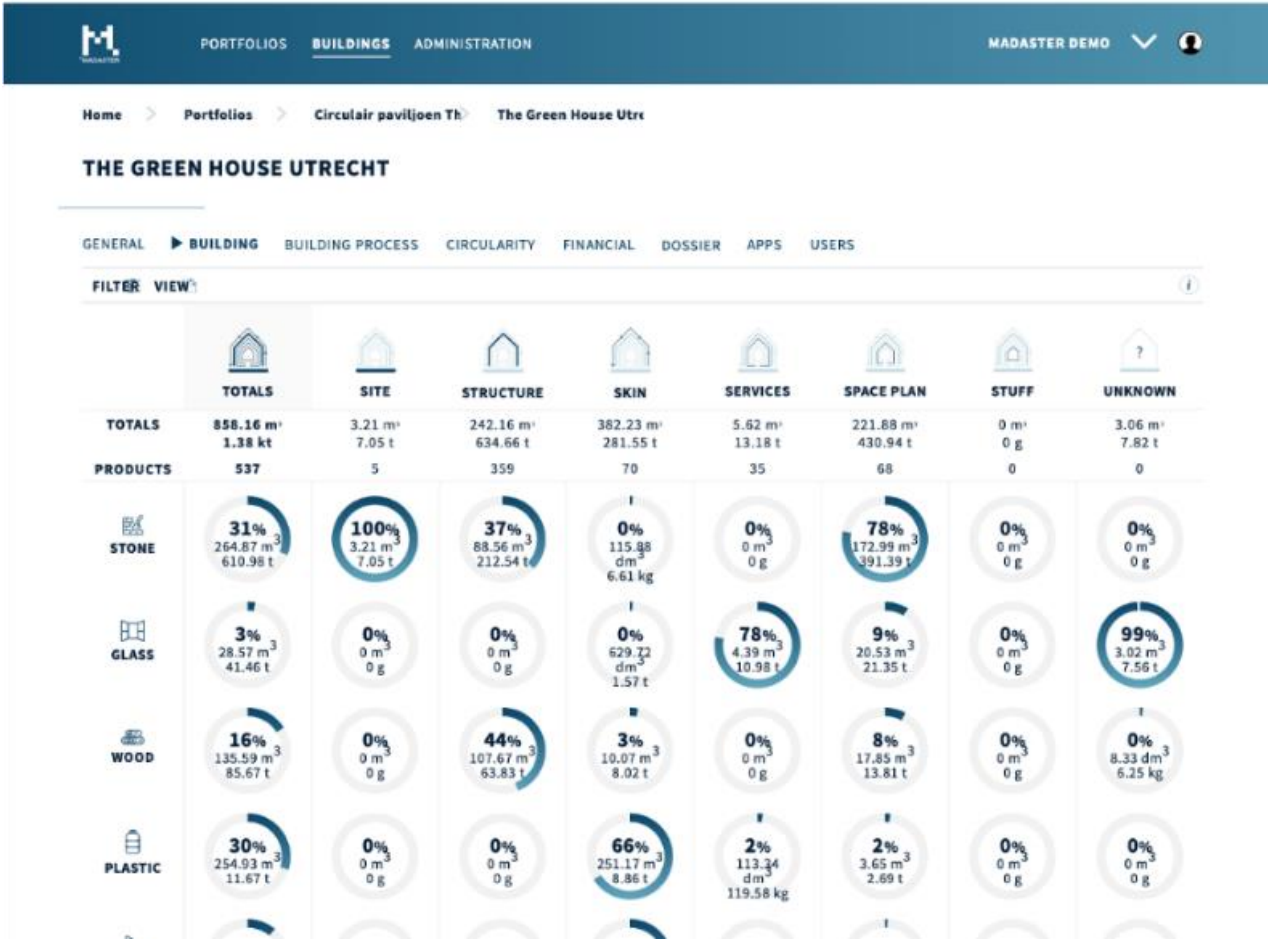
Optimizing transport and warehousing efficiency.

Product selection, increasing its lifecycle, repair potential, sharing economy, PaaS

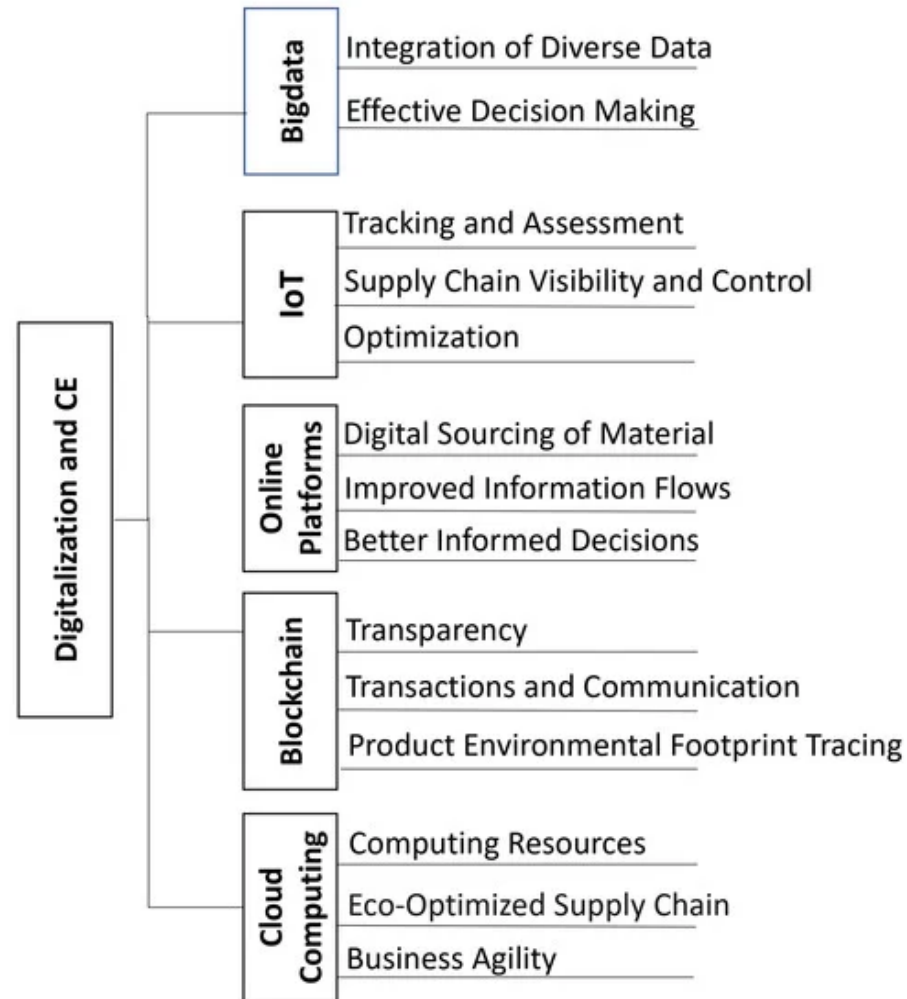
Reuse of goods and their elements, recycling activities, appropriate waste separation

Selected circular benefits

BASIC DATAPOINT IN CIRCULAR ECONOMY CONSIST OF INFORMATION ON EXTREMELY GRANULAR LEVEL



IS IT IMPOSSIBLE TO COLLECT, PROCESS AND USE SO MUCH DATA WITHOUT INNOVATIVE IT SOLUTIONS



THESE SOLUTIONS IN TURN NEED SPECIFIC FORMS AND STANDARDS



- Common labelling standards
- Machine readable standards that use digital data
- Backward and foreword compatibility

Meeting these needs will enable the transition from physical objects to data in the digital world, which is crucial for proper resource management. Additionally, as circular economy is in its infancy, **Identification of resources that are not labelled** is also needed.

The relevant data on the circular economy can be divided into four main groups:



Data on the full products' lifecycle



Data on resource flow during production, consumption and end of life



Data on system and network functioning and efficiency – on equipment, processes, actions and value chains



Data on consumers behaviour and consumption preferences

WITH THE DIGITIZATION OF DATA COLLECTION COMES THE NEED FOR THE DIGITIZATION OF THE KNOWLEDGE ACQUISITION PROCESS

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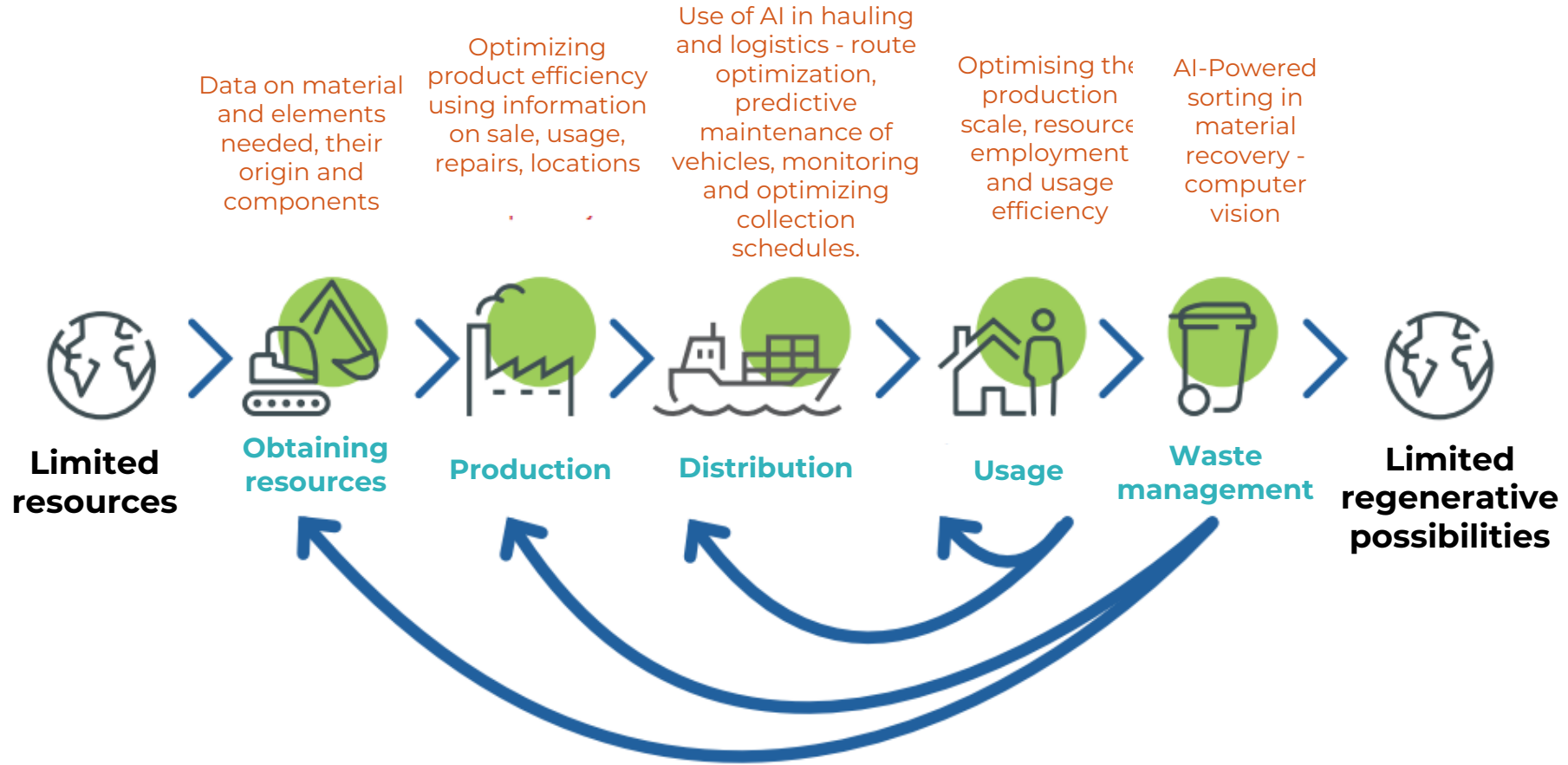
Artificial Intelligence (AI) can be used to process data and come to actionable conclusions. Those can be used to aid circular transition. Key AI techniques used for circularity advancement are:

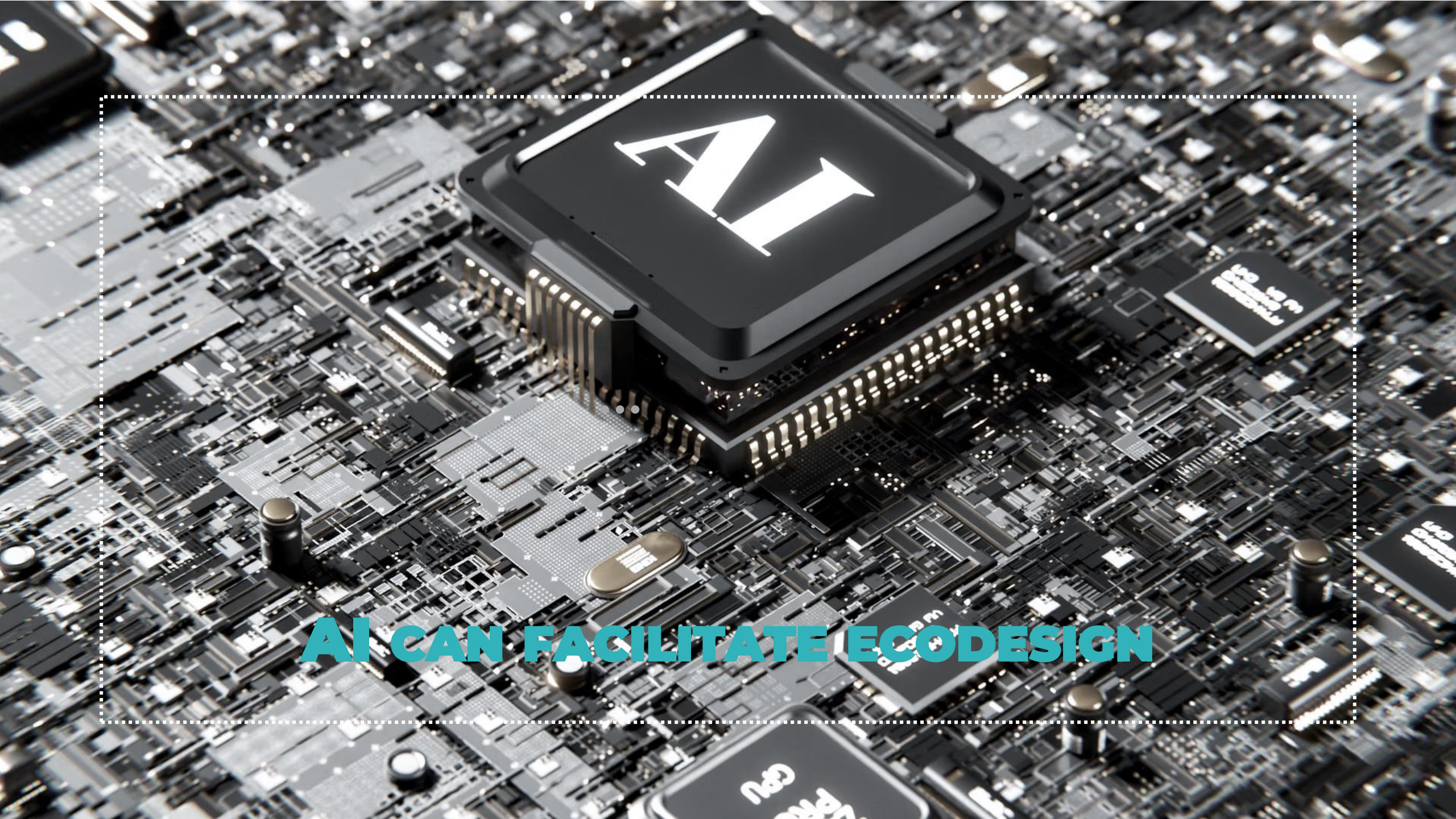
- **Machine learning** provides computers with the ability to learn from data, analyse and draw inferences from complex data patterns, and make predictions with minimal human intervention i.a. using statistical formulas and trainable algorithms.
- **Artificial neural networks** imitate the way nerve cells function in the human brain and employ learning algorithms capable of independently making adjustments as more data are input and explored, to solve relatively complex problems.
- **Convolutional neural networks** are a class of neural networks that are equipped with advanced digital image processing functions and are commonly applied to analyse visual imagery.
- **Timeseries Analysis** is a technique capable of working with variables evolving over time. This technique is very efficient in identifying specific trends in historical data in order to predict future events. Methods include lines of Best Fit, Auto Regression, Moving Average, and more advanced Deep Learning models such as Long Short-Term Memory

AI IS ALREADY HELPING THE CIRCULAR TRANSFORMATION



AI applications in circular economy examples





AI CAN FACILITATE ECODESIGN

MORE EFFICIENT MATERIALS DEVELOPMENT USING AI



Working with materials data, Citrine Platform used algorithms and AI technology to develop a 3D printable, aerospace-grade aluminium alloy. AI narrowed possible candidates for the alloy from 10 million to only 100.



AI ENABLE QUICKER DESIGN PROCES OF SUSTAINABLE PRODUCTS



Chilean brand NotCo made an egg-free mayonnaise using plant-based substitutes with the help of an AI-based ecosystem. It deploys a Machine Learning algorithm to identify new plant-based foods and food formulas by detecting patterns at a molecular level. This helps in quick testing, tasting, and providing feedback to ensure that the final product tastes as good as the original one.



MORE EFFICIENT USE OF MATERIALS THROUGH AI



Arup designed a construction structural node using i.a. machine learning and 3D printing to decrease the amount of material by over 40%. At the same time, the reliability and other structural characteristics of the node remained unchanged.





**AI CAN HELP OPTIMISE THE
PRODUCTION SCALE, RESOURCE
EMPLOYMENT AND USAGE EFFICIENCY**

AI CAN OPTIMIZE THE LOGISTIC PROCESS



Amazon created sustainable packaging designs leveraging AI algorithms to identify products that can be shipped in padded mailers instead of boxes, making packages lighter. This increases the number of packages dispatched per truck, thereby reducing the amount of packaging that needs to be recycled, eventually causing a decline in the carbon footprint per item along with slashing delivery costs.



AI CAN INVESTIGATE CUSTOMER PREFERENCES TO ADJUST PRODUCTION ACCORDINGLY



H&M amplifies business solutions with AI to consider its environmental impact. The company uses big data to analyse customer needs at a local level. AI analyses store receipts, returns in the store, and loyalty-card data to study customer demands. In addition, the algorithms look at blog posts and search engines to gather more information about fashion trends.

In effect the company can produce only the right products in the right amounts and allocate them to the right place. The framework delivered immense business value by reducing time-to-market for use case development by 50 percent (i.e. from 12 to six months).

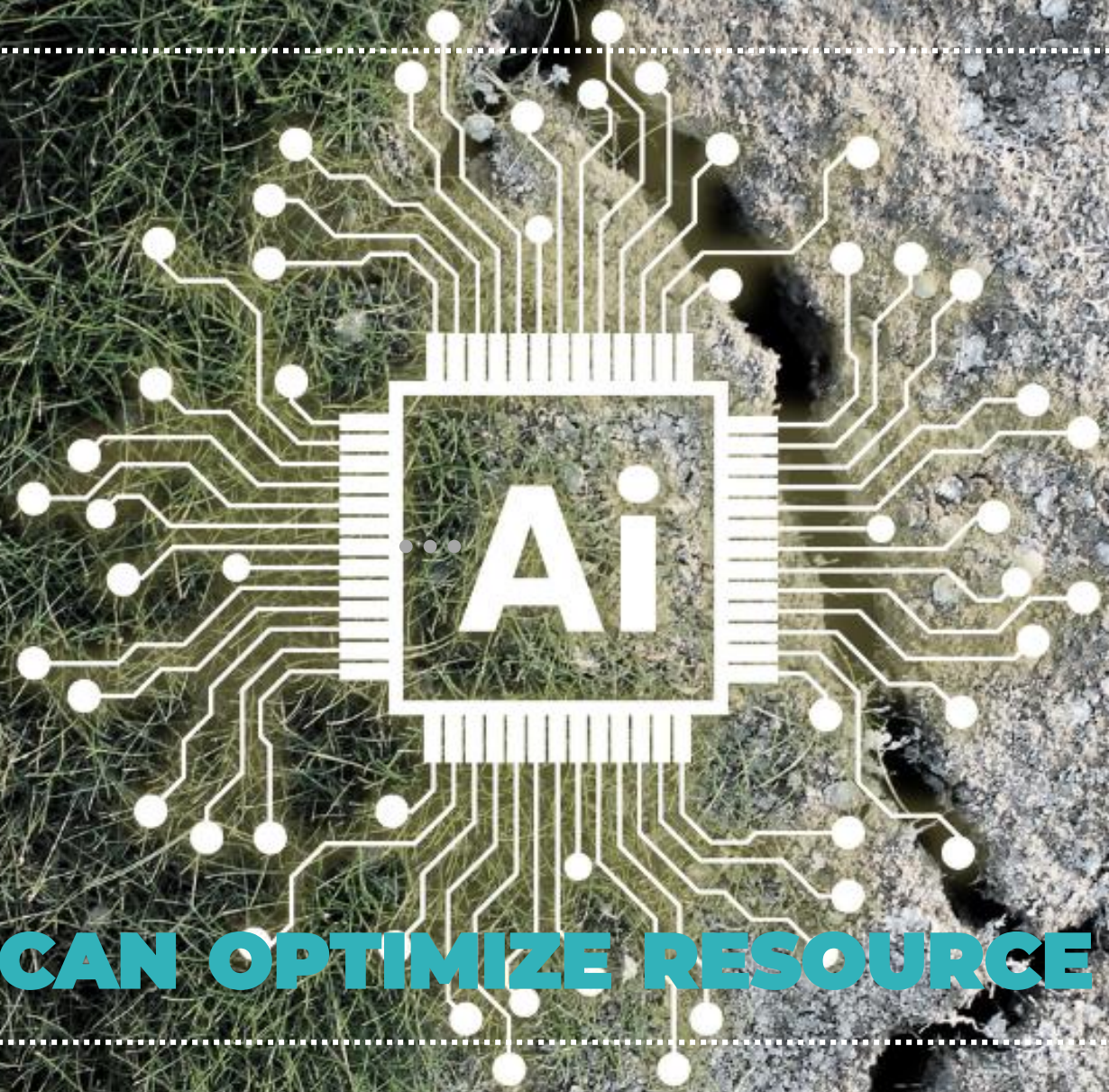


AI CAN DETECT THE NEED FOR MODIFICATION IN THE PRODUCTION PROCESS



Companies like FARMWAVE, Taranis and Aerobotics are using AI to interpret smartphone, satellite and drone imagery of crops to detect signs of pests and diseases as early as possible, so farmers can target their interventions and reduce crop loss. There is also possibility of monitoring soil humidity and vegetative cycle to plan agricultural work as well to optimize fertilizer use.





AI CAN OPTIMIZE RESOURCE REUSE

AI ENABLES SORTING OF PROBLEMATIC WASTE

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Unilever and the Alibaba Group created an AI-enabled recycling system that automatically identifies and sorts plastic packaging. It aims to speed up high-grade plastic reuse. It automatically identifies the type of plastic, sorts it and stores it, collects and returns it to recycling centers, and fast-tracks it for reuse rather than being left to degrade.



AI CAN FACILITATE LIMITING WASTE AND REUSE



Refind Technologies has created systems that can automatically identify and sort batteries as well as classify and sort cell phones.

The company's services enable companies to extract the full value from e-waste streams in two ways:

- first, it helps reduce e-waste by improving overall recycling and refurbishment rates;
- second, it increases its value by identifying whether a product's condition is more suitable for refurbishment or recycling.

Sorting systems, equipped with sensors and cameras, through visual recognition and supervised machine learning technology, can classify the type and condition of e-waste, resulting in safer, faster and higher quality sorting.



AI CAN OPTIMISE RESELLING THE USED GOODS



At Ikea, 15 percent of its returned items become waste. To tackle this, Ikea has adopted AI for handling returned merchandise. Ikea installed an AI platform developed by its partner in 50 locations across the US. It predicts the best possible destination for returned merchandise, whether it should be back on the floor, on the website, donated to charity, or sold to a third-party wholesaler.



A person in a dark blue suit and tie stands against a light grey background. Above their head is a large, dark, billowing cloud of smoke or steam. In the center of this cloud, the letters 'AI' are written in a bright, glowing cyan color. Three small white dots are positioned below the 'A'. The entire scene is framed by a white dotted border.

AI

AI ENVIRONMENTAL CONCERNS

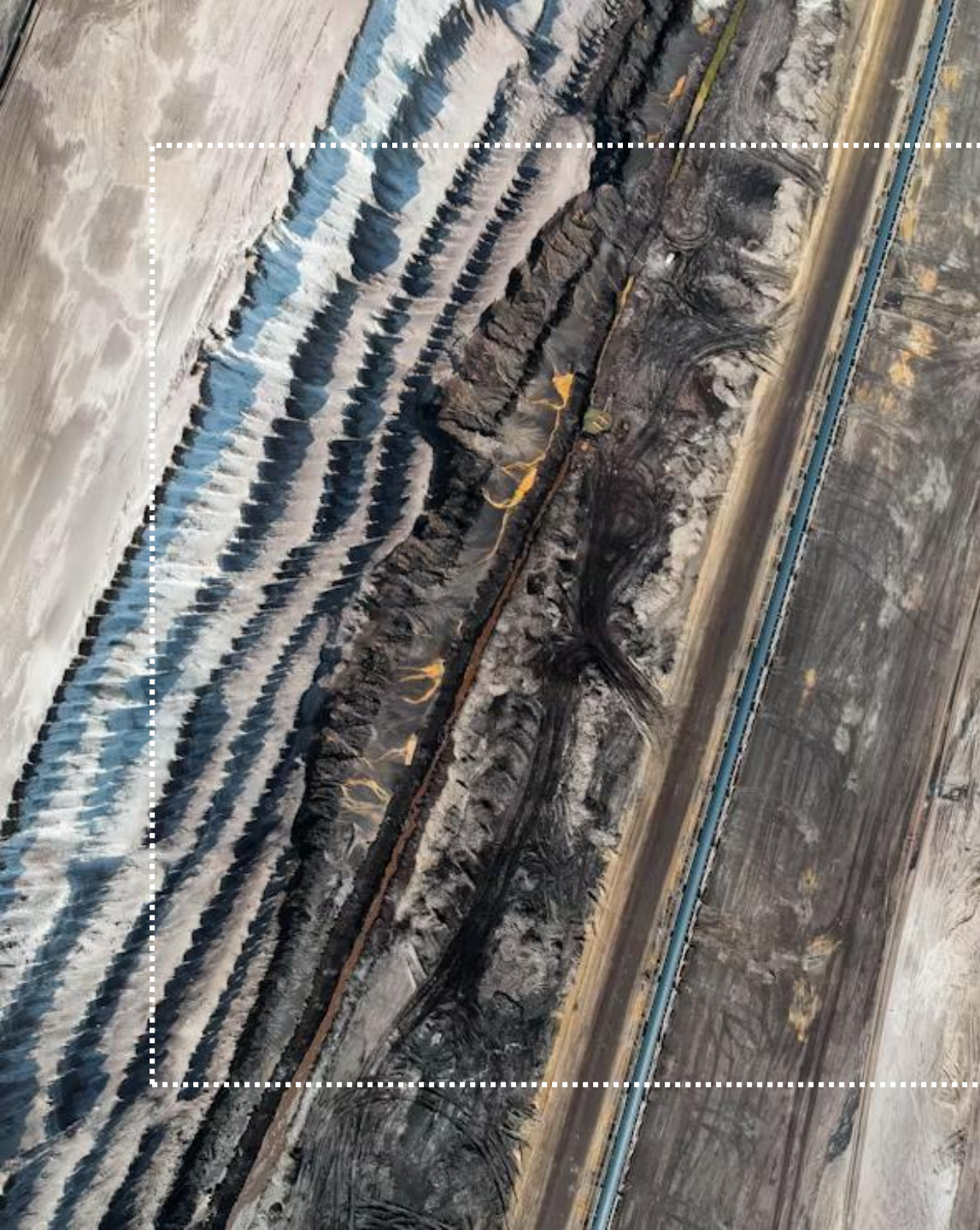


AI EMISSIONS ARE A CAUSE FOR CONCERN

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The increasing energy demands for training general purpose AI systems can lead to immense Greenhouse gases emissions. Globally, computation used for AI is projected to require at least 70 TWh of electricity in 2026, roughly the amount consumed by countries such as Austria or Finland.

In the US, for example, where many leading AI companies are currently located, electric grids and transmission infrastructures may struggle to accommodate the surge in AI-related electricity demand.



AI CAUSES STRAIN ON CRITICAL MATERIALS



The primary driver of compute scaling has not been improved GPU performance, but the increase in the number of GPUs used. GPU price performance and energy efficiency for relevant computation have been improving roughly 30% annually, However, the total compute used in training has increased by approximately 4x per year since 2010, outpacing the rate of hardware efficiency improvements. This suggests that increased spending, rather than gains in hardware efficiency, has been the primary driver of the growth in compute budgets for AI training. While the increased production of GPUs increases the demand for critical materials they are typically made of.



POSSIBILITY OF AI GOING ROGUE IS NON-NEGLIGIBLE

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- In 2022, a survey of AI researchers found that the majority believed there is a 10 percent or greater chance that human inability to control AI will cause an existential catastrophe.
- In 2023, hundreds of AI experts and other notable figures signed a statement declaring, "Mitigating the risk of extinction from AI should be a global priority alongside other societal-scale risks such as pandemics and nuclear war".



Thank you!