Methodology for material mapping for effective construction waste management during the life cycle of a built structure and tools for its practical application.

**Open day
China 2024**

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WORK ON PROGRESS

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STRABAG
WORK ON PROGRESS

> STRABAG SE is a **European-based technology group for construction services**, a leader in **innovation** and **financial strength**. Our activities span all areas of the construction industry and cover the **entire construction value chain**. We create added value for our clients by taking an end-to-end view of construction over the **entire life cycle** – from planning and design to construction, operation and facility management to redevelopment or demolition. In all of our work, we accept **responsibility for people and the environment**: We are shaping the future of construction and are making significant investments in our portfolio of more than **250 innovation** and **400 sustainability projects**.

■ region-wide presence
■ project business

Only countries with a minimum annual output volume and a minimum order backlog of € 1 mn are considered.

Standardisation
Examples

Offsite production

Modular construction

Digital processes
Examples

BIM 5D ®

GIS data

Automation
Examples

Construction robotics

PEOPLE
More for people.

Employee focus
promotes our most important asset: people.

Global-local presence
ensures that we are anchored in the local communities.

PLANET
More for the planet.

Circularity
helps us fight environmental pollution and the shortage of raw materials.

Expertise in the energy sector
makes us a key player in shaping the energy transition.
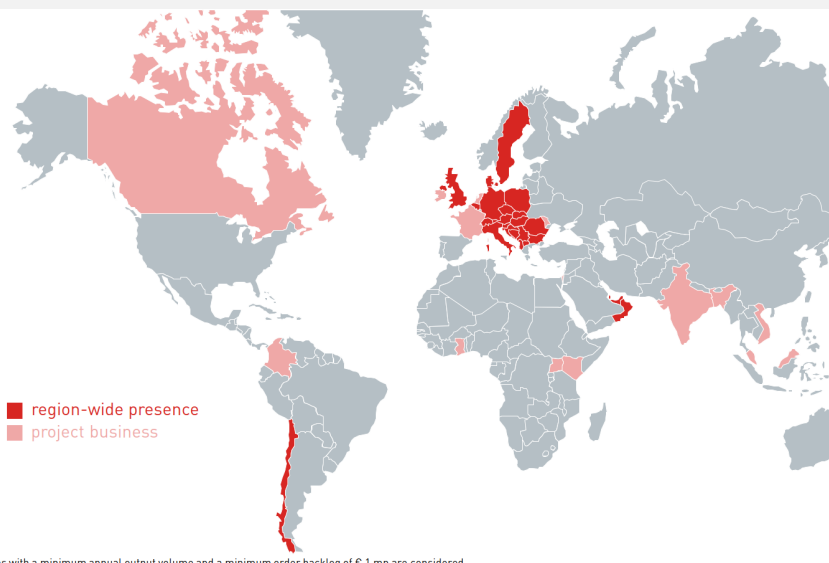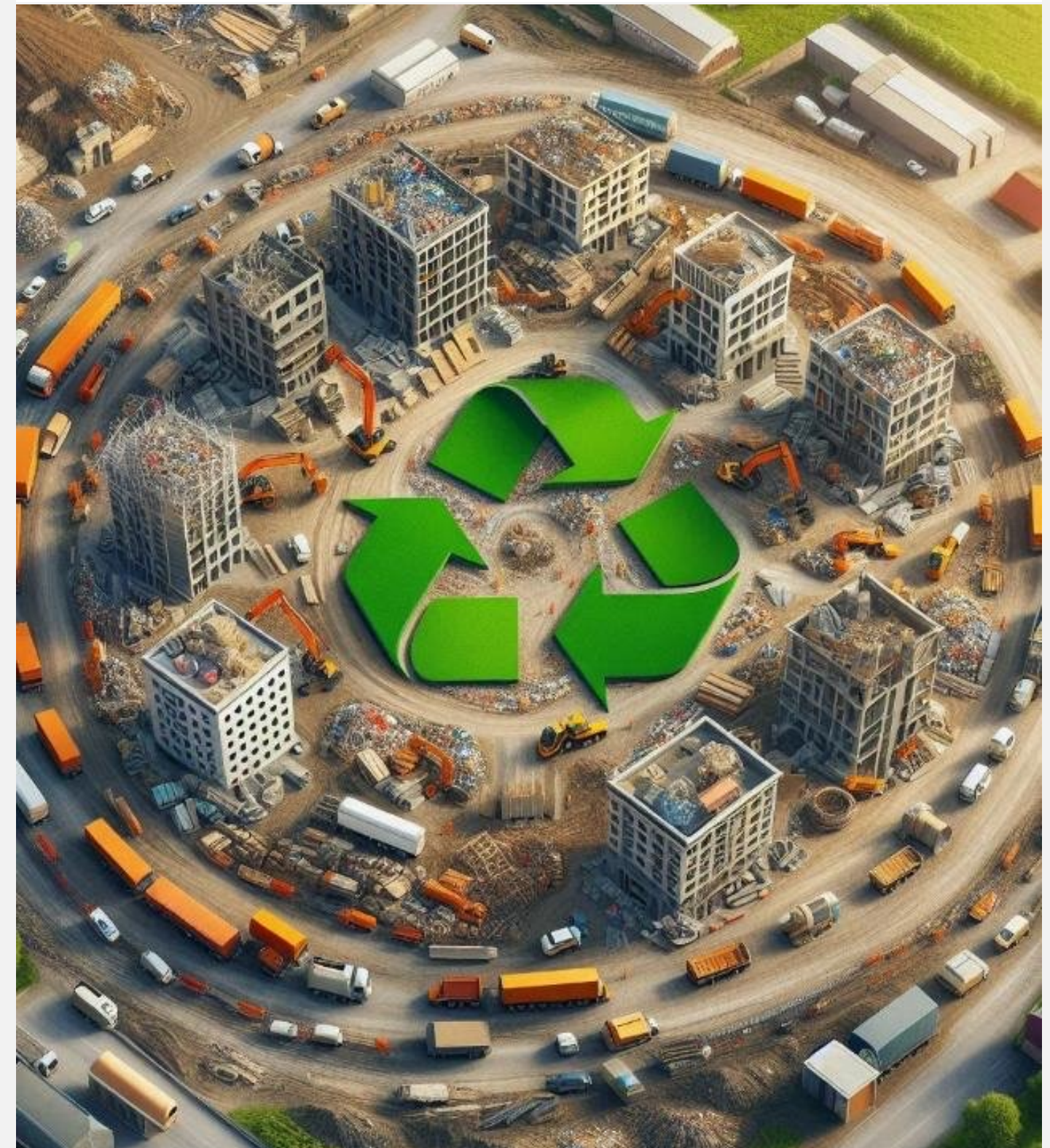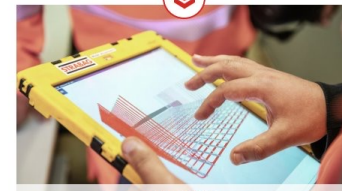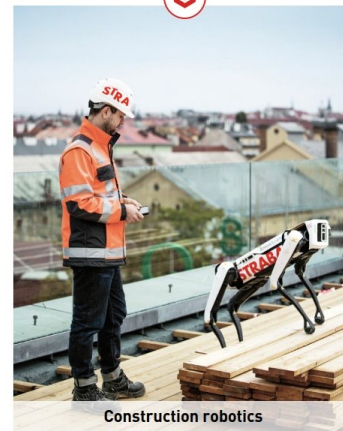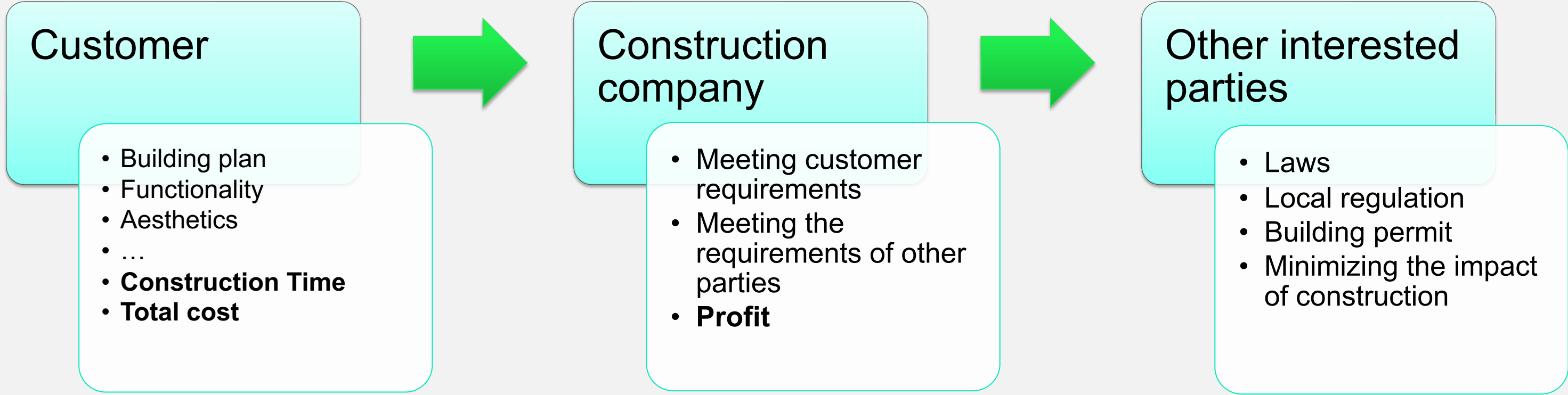
PROGRESS
More for progress.

Technology leadership
helps us to constantly become more efficient and effective.

Depth of value creation
makes us more resilient to external influences.

Construction project target values and our goals

Customer

- Building plan
- Functionality
- Aesthetics
- …
- **Construction Time**
- **Total cost**

Construction company

- Meeting customer requirements
- Meeting the requirements of other parties
- **Profit**

Other interested parties

- Laws
- Local regulation
- Building permit
- Minimizing the impact of construction

Standardization and clearly defined processes in all areas of activity will help us to be more efficient in the achievement of our goals.

Our goal is to **prevent the generation of construction and demolition waste** throughout the entire life cycle of a building

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Waste management methodology and its basic input conditions

Waste management hierarchy

- Prevention
- Re-use
- Recycling
- Recovery
- Disposal

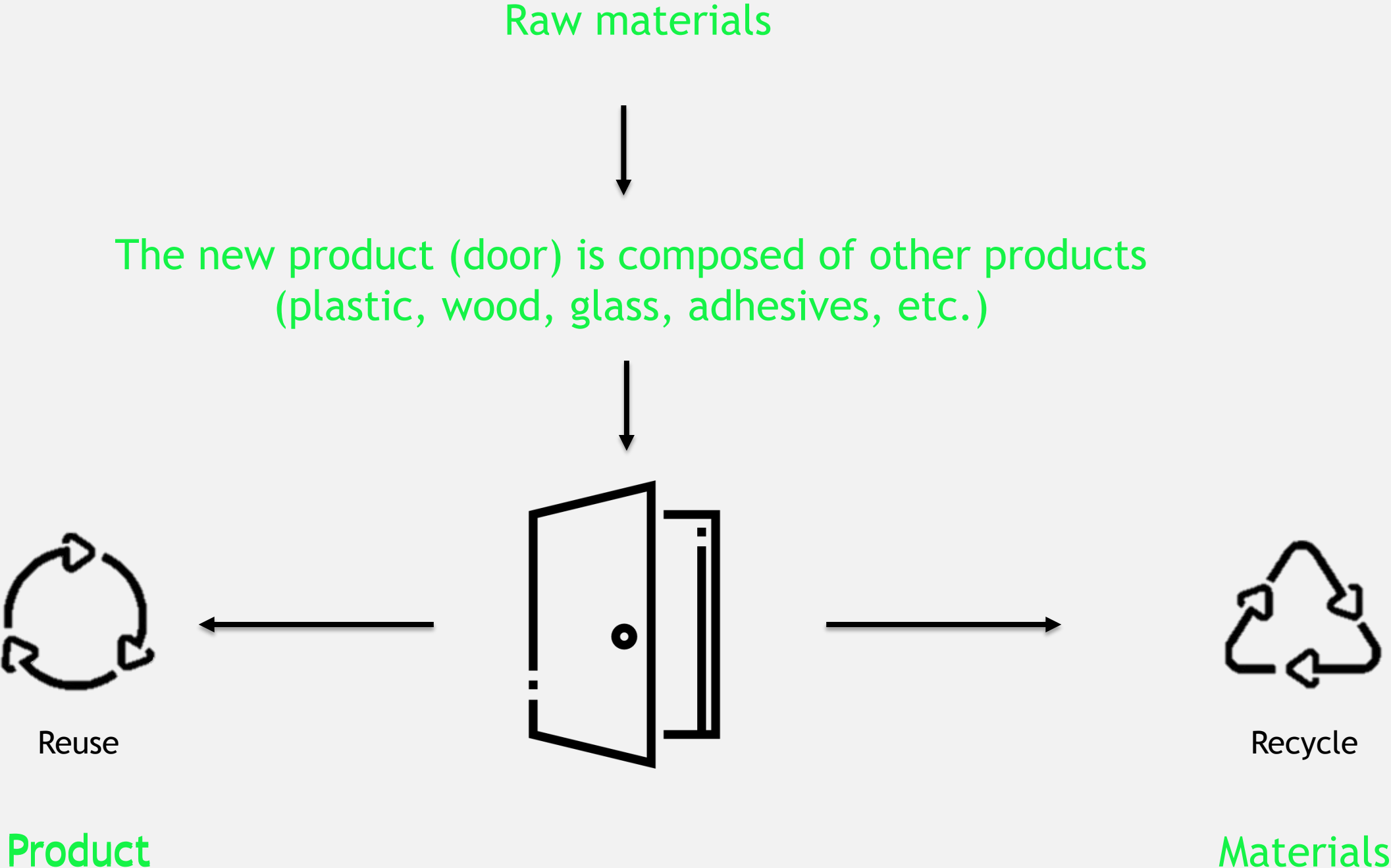Most Preferred

Least Preferred
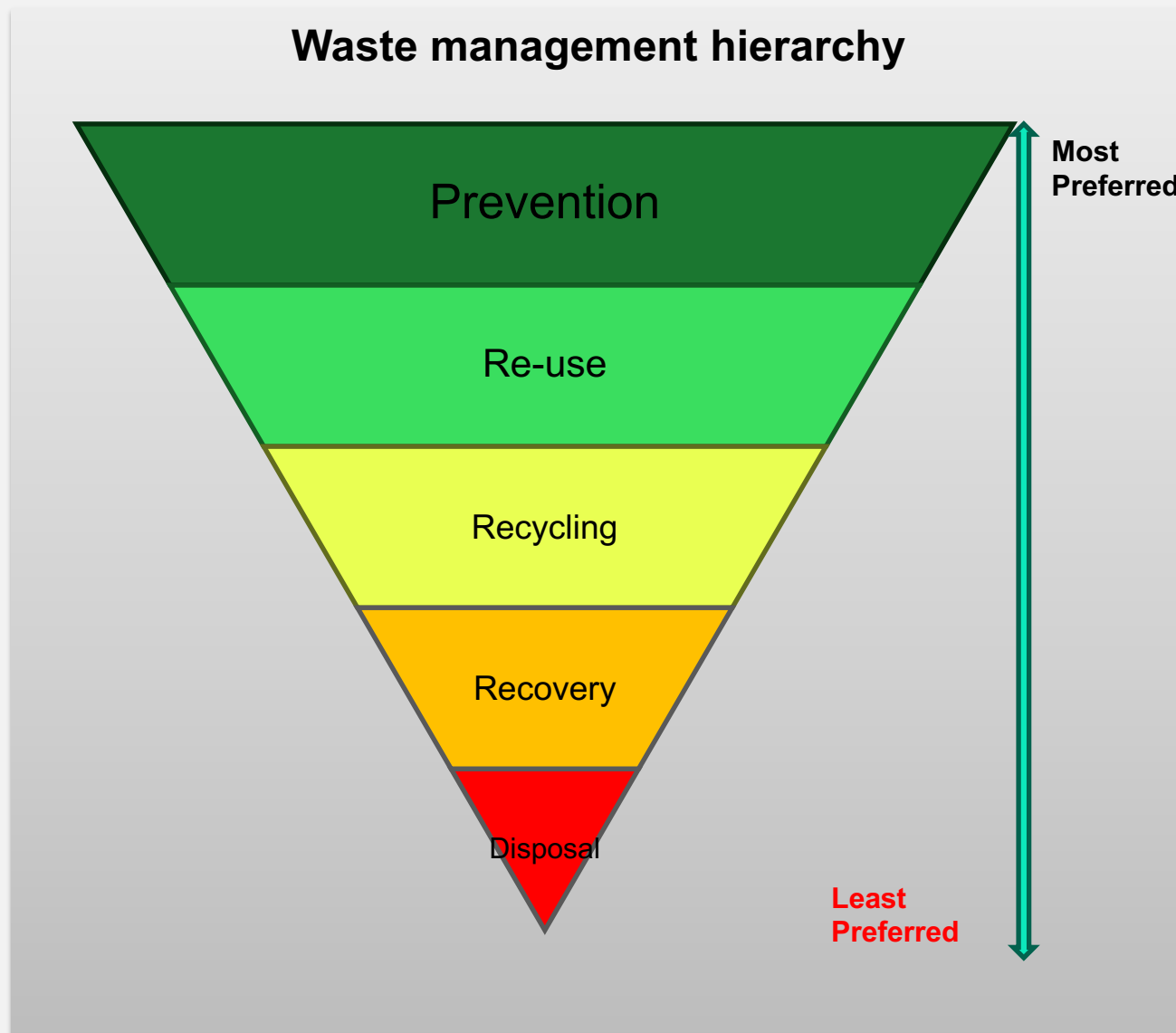
Product identification

- Manufacturer's information
  - Design information
- Construction information
  - **Material composition**
    - Quality declaration
    - Chemical information
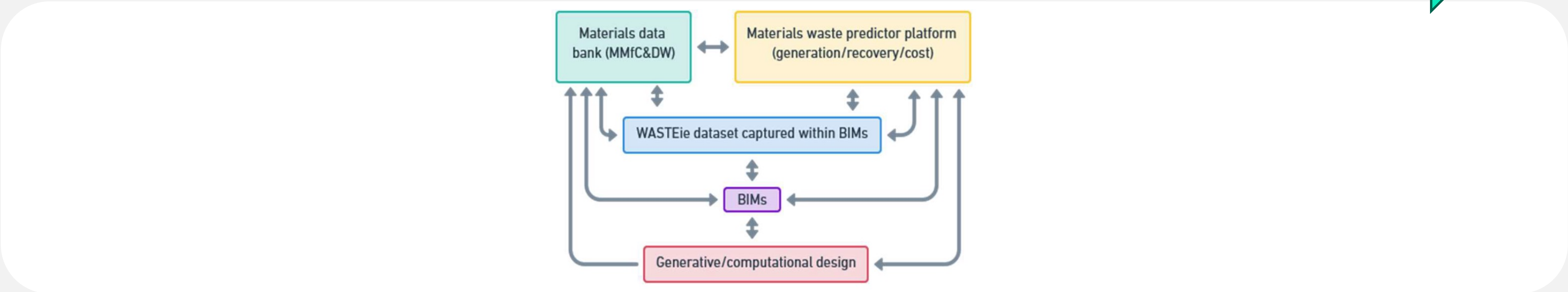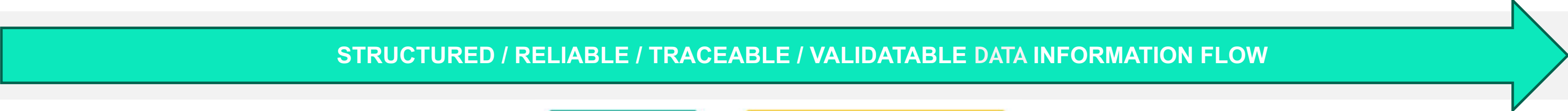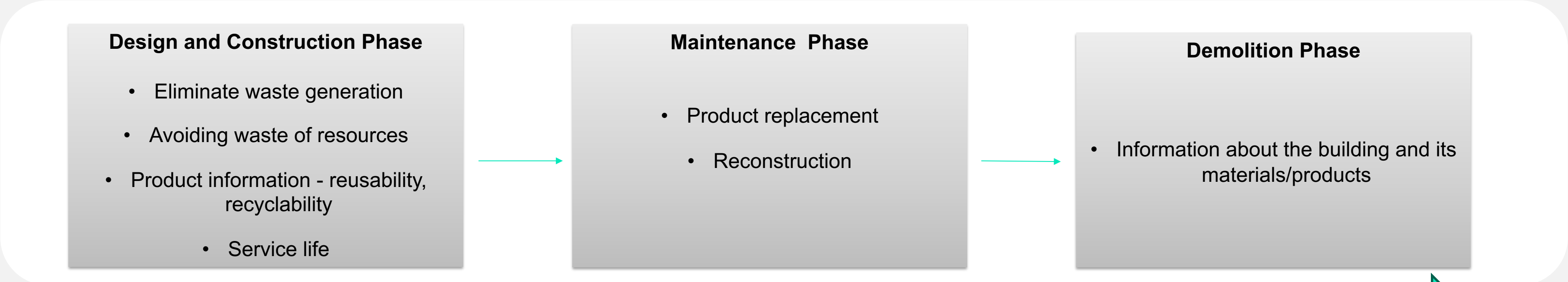   - Physical information
- Mechanical information

Building type

- Construction type
- Projected service life
  - Environment
  - Purpose of use

Data Structure

Raw materials

The new product (door) is composed of other products
(plastic, wood, glass, adhesives, etc.)

Reuse

Recycle

Product

Materials

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Waste management methodology from the perspective of the construction life cycle phase

Design and Construction Phase

- Eliminate waste generation
- Avoiding waste of resources
- Product information - reusability, recyclability
- Service life

Maintenance Phase

- Product replacement
- Reconstruction

Demolition Phase

- Information about the building and its materials/products

STRUCTURED / RELIABLE / TRACEABLE / VALIDATABLE DATA INFORMATION FLOW

Share gathered data with designers through a cloud based definitions

Example: https://bimproject.cloud/
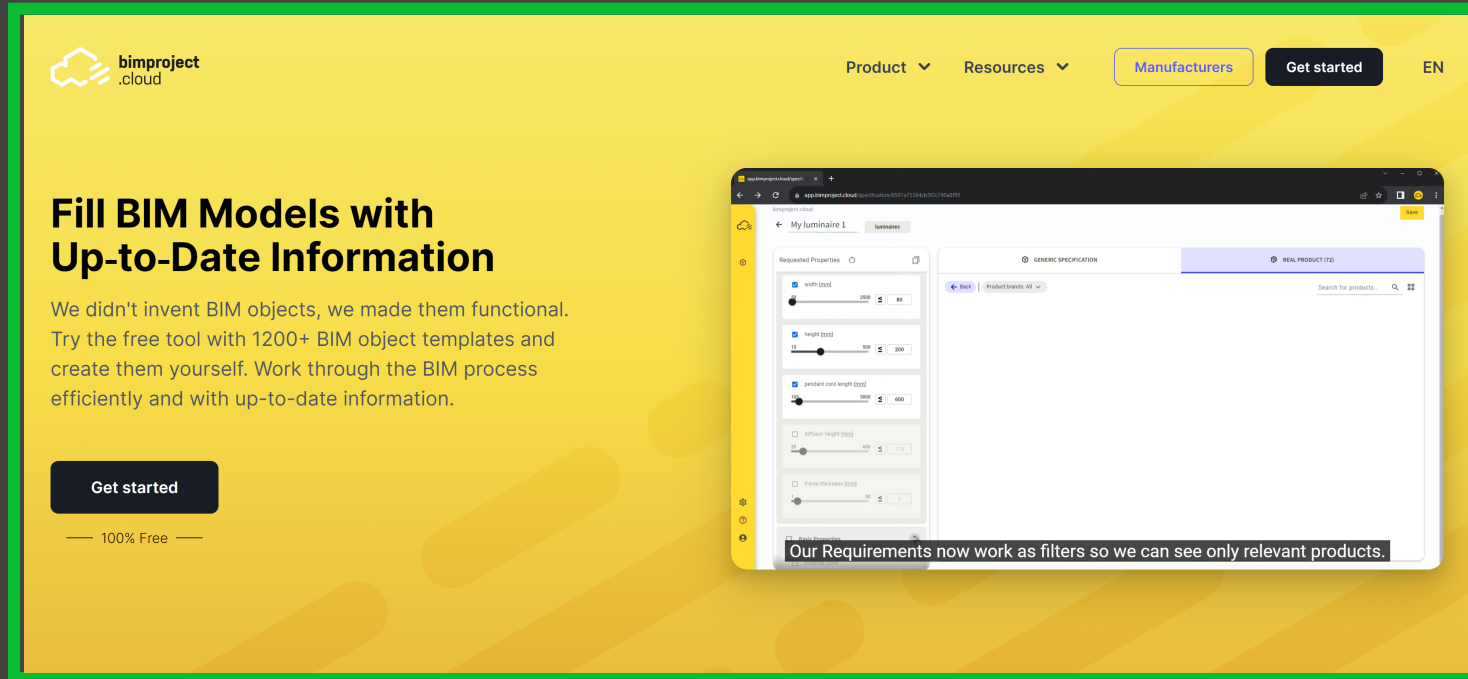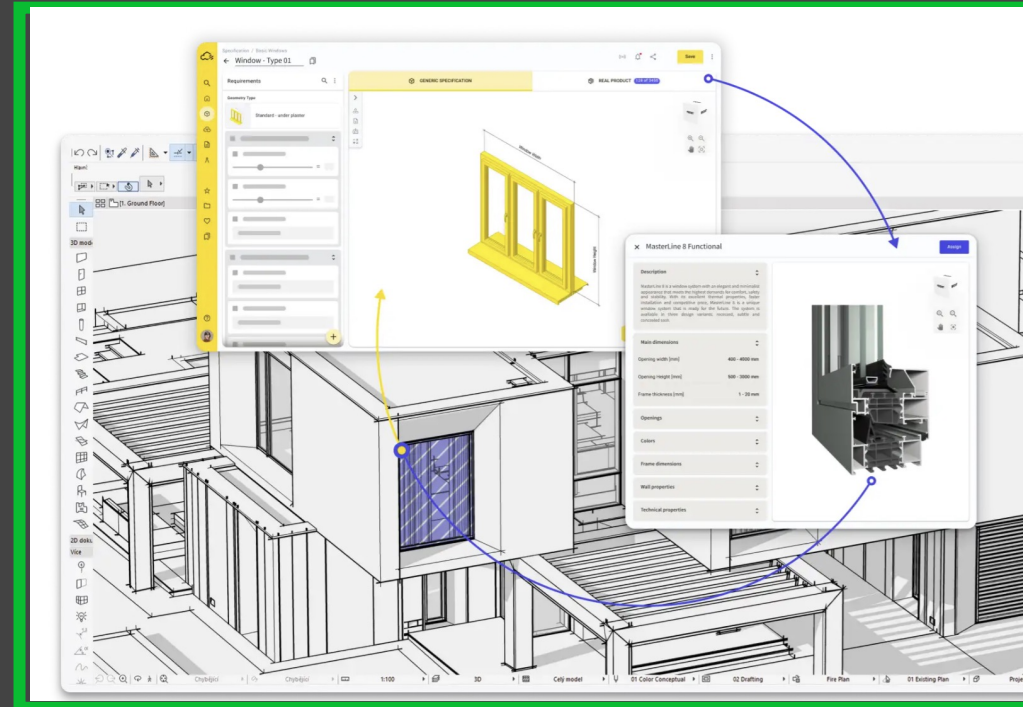
Getting model and material attributes
of a desired product

https://www.gs1.org/services/verified-by-gs1

Coonect facility with your digital twin
through GTIN code

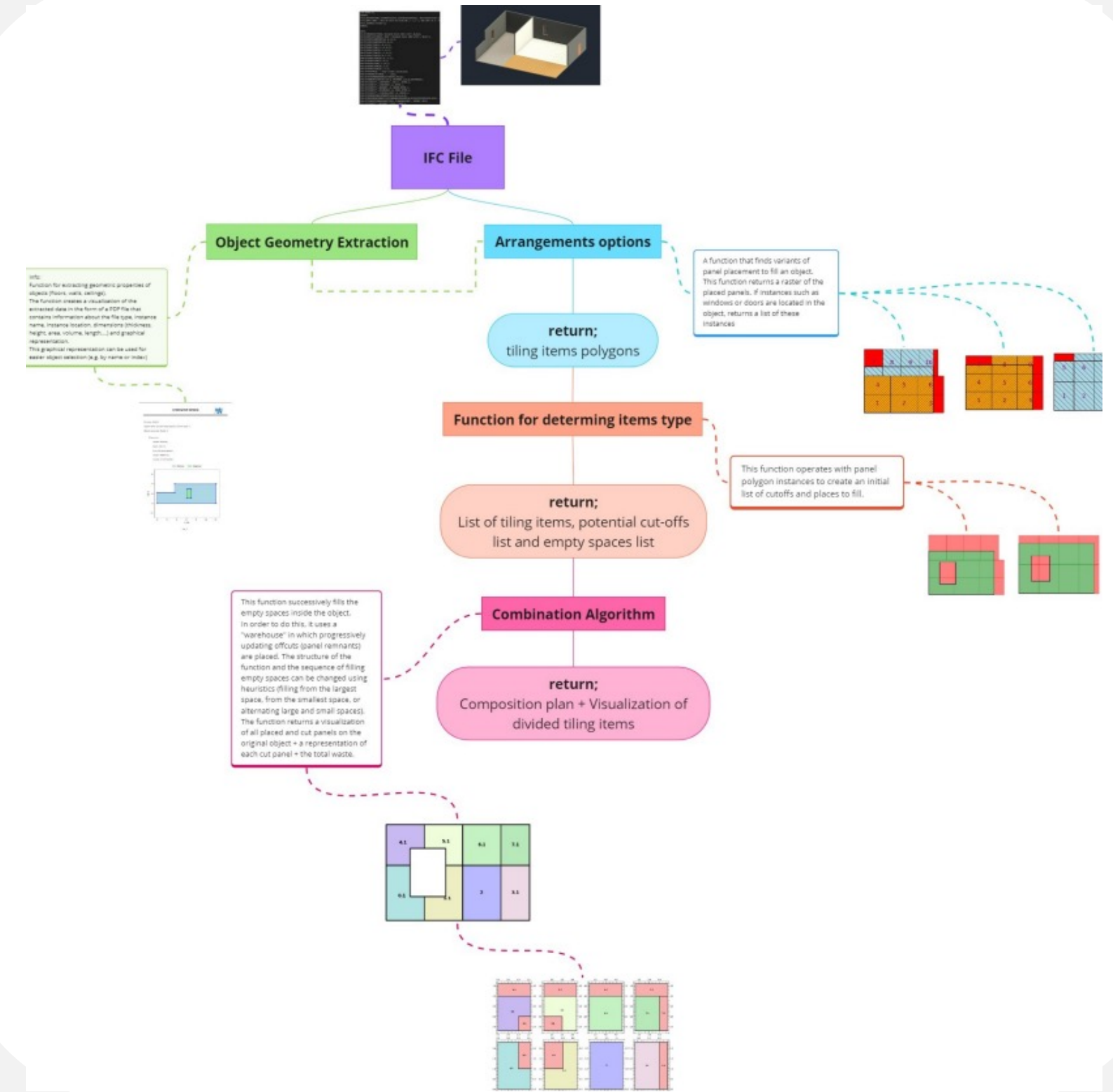Revit model attributes and its values

Control whereabouts of products and your digital
twin with its material data sets

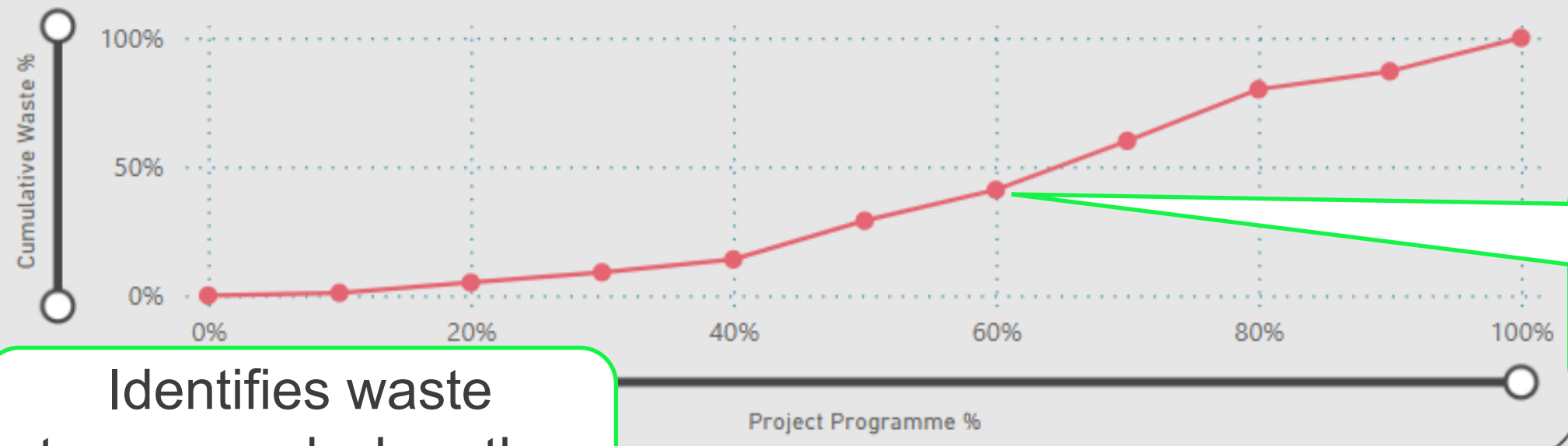Reconmatic

Generative design
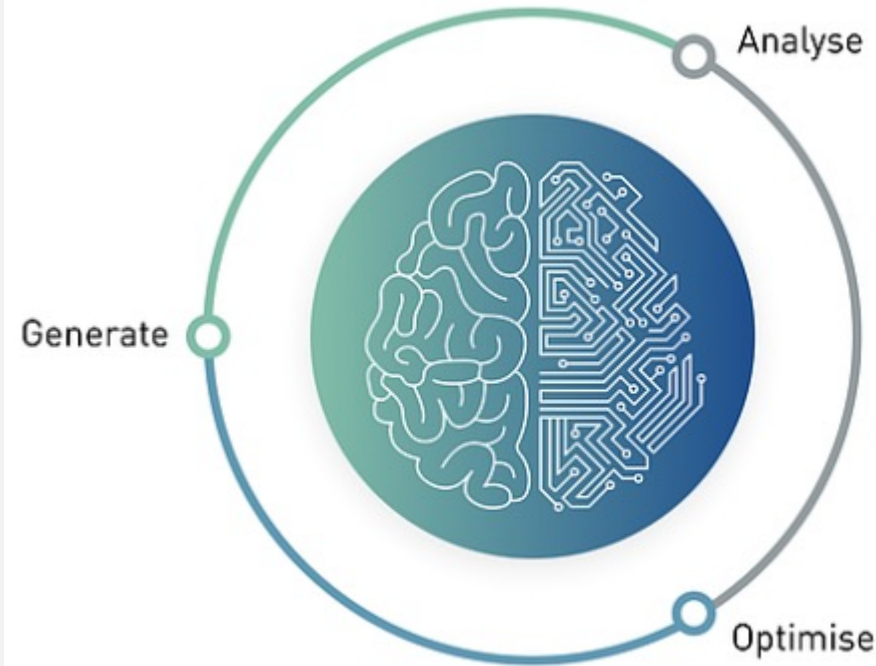
- **Generate**
  Hundreds of design proposals are generated in a very short amount of time. Innovative results are created that might have remained undiscovered with manual design planning.

- **Analyse**
  The system analyses the design variants with regard to the optimisation goals. Design specifications, including the defined parameters and spatial conditions, are automatically taken into account.

- **Optimise**
  The result: optimised design proposals based on the previously defined requirements and goals. The most suitable variant is then chosen and further adapted if necessary.

WASTE PREDICTOR

MORGAN SINDALL CONSTRUCTION

Building Type
Further and Higher Education

Frame Type
Steel Frame

Average Cumulative Waste throughout Project Programme

Cumulative Waste %: 100%, 50%, 0%
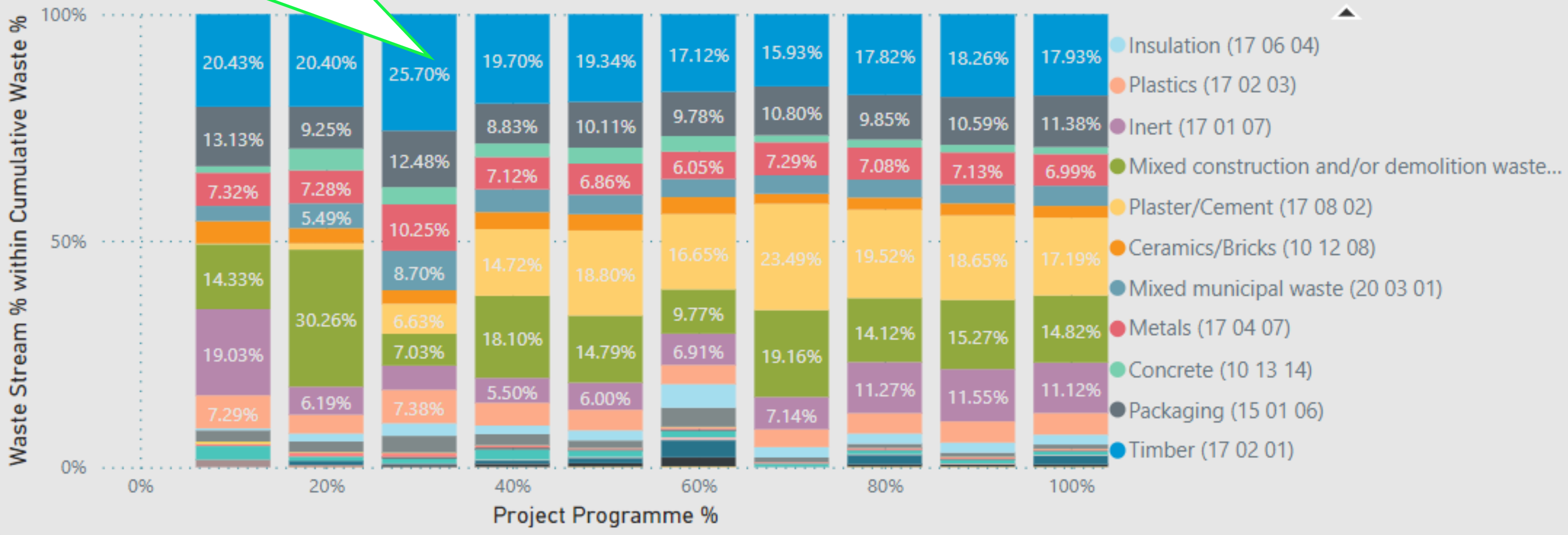Project Programme %: 0%, 20%, 40%, 60%, 80%, 100%

Waste is never a straight line

Identifies waste streams and when they occur

Filtered by project and building type

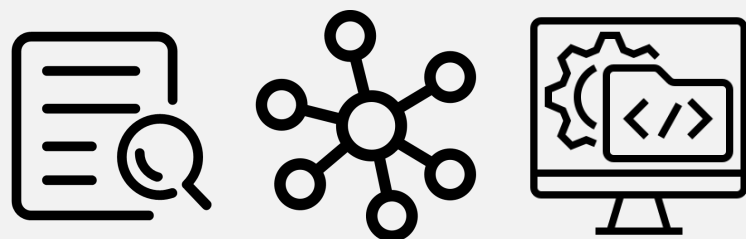## % of Waste Streams throughout Project Programme %
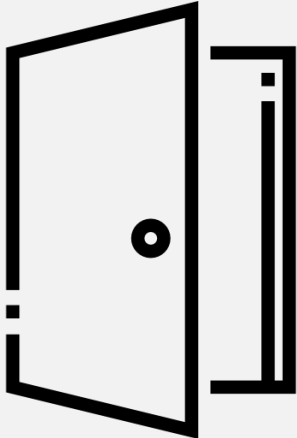
Project Programme %								
20.43%	20.40%	25.70%	19.70%	19.34%	17.12%	15.93%	17.82%	18.26%	17.93%
13.13%	9.25%		8.83%	10.11%	9.78%	10.80%	9.85%	10.59%	11.38%
7.32%	7.28%	12.48%	7.12%	6.86%	6.05%	7.29%	7.08%	7.13%	6.99%
	5.49%	10.25%							
14.33%		8.70%	14.72%	18.80%	16.65%	23.49%	19.52%	18.65%	17.19%
	30.26%	6.63%			9.77%				
19.03%		7.03%	18.10%	14.79%	6.91%	19.16%	14.12%	15.27%	14.82%
	6.19%		5.50%	6.00%			11.27%	11.55%	11.12%
7.29%		7.38%			7.14%				

Project Programme %: 0%, 20%, 40%, 60%, 80%, 100%

Waste Stream % within Cumulative Waste %: 100%, 50%, 0%

Legend:
- Insulation (17 06 04)
- Plastics (17 02 03)
- Inert (17 01 07)
- Mixed construction and/or demolition waste...
- Plaster/Cement (17 08 02)
- Ceramics/Bricks (10 12 08)
- Mixed municipal waste (20 03 01)
- Metals (17 04 07)
- Concrete (10 13 14)
- Packaging (15 01 06)
- Timber (17 02 01)

Project Programme %

10%	60%
20%	70%
30%	80%
40%	90%
50%	100%

Industry Foundation Classes
Data Dictionary

WASTEie

RECONMATIC

Name	RECONMATIC
Website URL	https://www.reconmatic.eu/

Dictionaries

Name	Current version	Status	Release date
European Waste Classification Codes for Construction and Demolition	0.0.1	Preview	2024-07-01
WASTEie	0.0.8	Preview	2024-07-17

Information Delivery Specification

verify

enrich

Data dictionary

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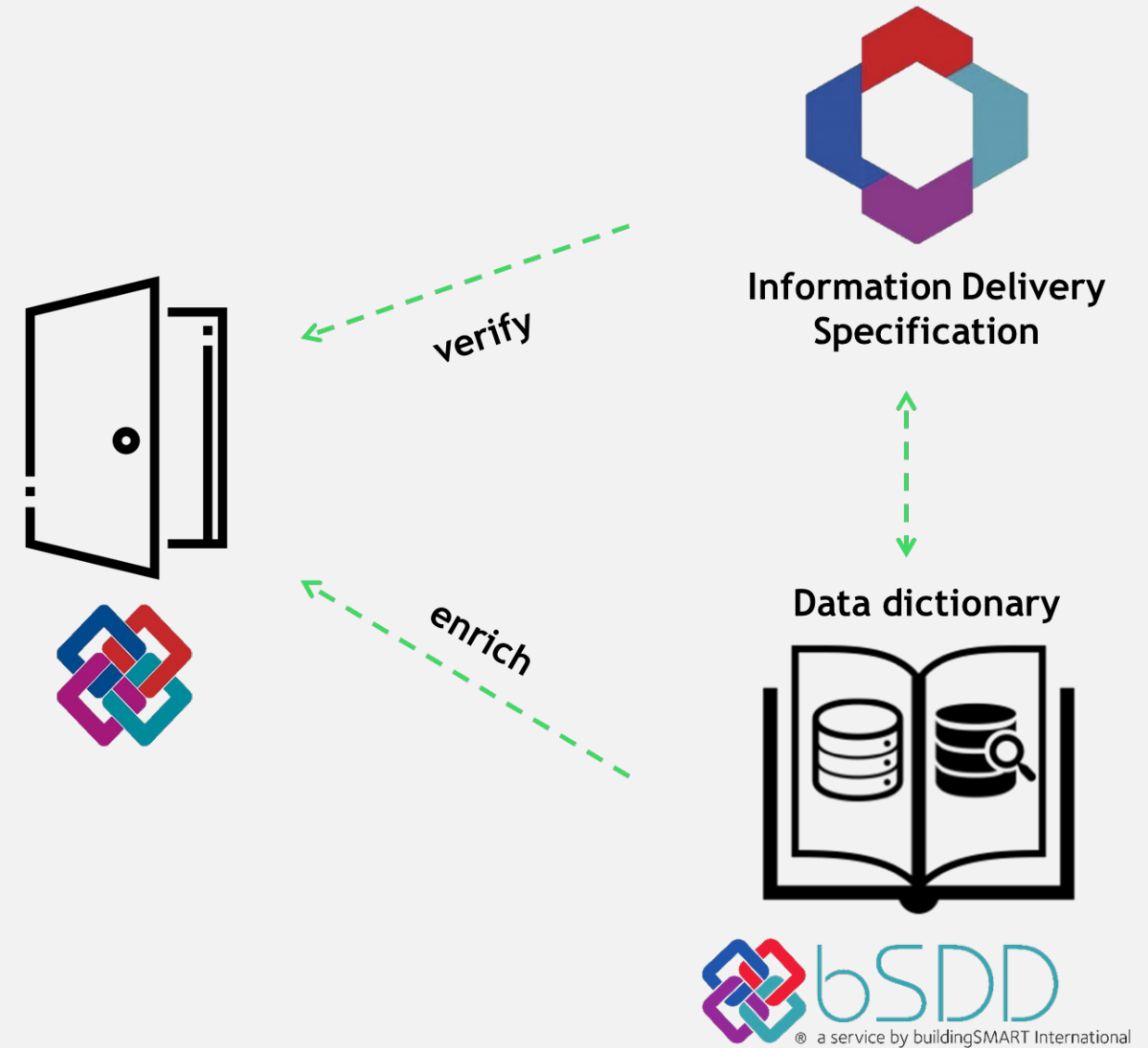
Example of usability of construction information

Batching plant

smart order-delivery-logistics tool
- ○ order placement
- ○ production
- ○ delivery
- ○ return

ordered quality

lower quality

Construction site

- *delayed delivery*
- *wrong mixture*
- *over-ordered quantity (safety or overestimation)*
- *concrete pump leftover*

leftover

over-ordered

blend with next batches

batching plant automation

pre-cast elements

slurry

dispose for hardening

mechanically crush

wash

reclaim raw agreegates

water reclaim

recycled (concrete) aggregates

landfilling

recycled water

raw aggregates

recycled aggregates

Automatic upload of delivery sheet data to CDE (Common Data Environment)

Concreting process control including quality control

Use of concrete mix information in recycling (UP-CYCLING)

- Saving time and costs for testing or mineralogical composition

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THANK YOU
FOR YOUR ATTENTION

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