

How close is the Built Environment to achieving circularity?

<https://bit.ly/2Srwy9m>

“Businesses throw away hundreds of billions worth of valuable materials because they are not designed for recovery. What is gained on the front end through convenient bonding is lost on the back end through destructive mixing of materials that degrades their quality.”

(Mulhall and Braungart 2013: 76) [8]

Conference: Buildings as Material Banks

Presenter: August Nazareth, Circular Economy Strategy/Consultant

February 6th 2019



Outline of a circular economy

OUTLINE OF A CIRCULAR ECONOMY

PRINCIPLE

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
ReSOLVE levers: regenerate, virtualise, exchange



Regenerate Substitute materials Virtualise Restore

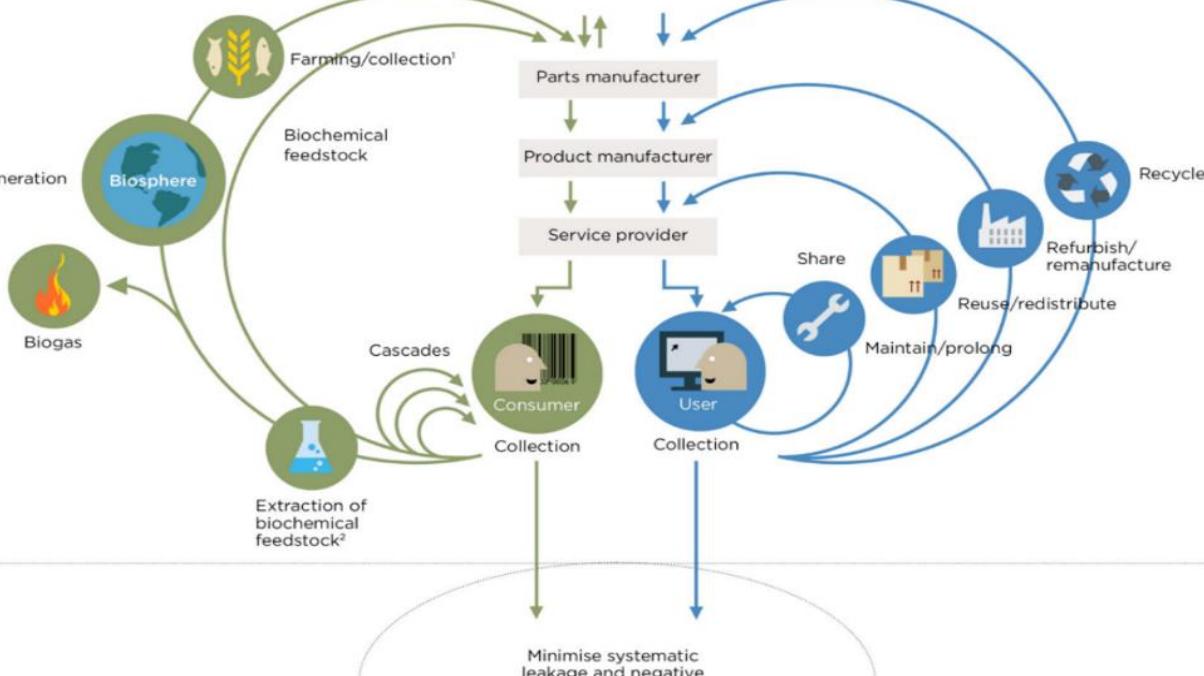
Renewables flow management

Stock management

PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
ReSOLVE levers: regenerate, share, optimise, loop



1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

Source: [EMF](#)

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What does research show?

- Research for this paper indicates the circular economy is still a little known initiative to almost everyone not directly involved in it. Construction and the built environment are no different
- Only 9% of the global economy is circular (EMF)
- New initiatives like “[A line in the sand: Global Commitment to eliminate plastic pollution at its source](#)” have over 250 large organisations (Pepsico, IKEA, H&M, Unilever) committing to the circular economy. All supply/value chains are likely candidates for change.

So what can the supply/value chain in the built environment do about becoming more circular, and then fully circular?



Approach – Start at the easiest points:

One, Identify what is ALREADY circular or close to circularity in existing processes/systems and known frameworks (BIM, LEAN, BREEAM, etc.) that are readily understood by the stakeholders within the firm and its wider industry.

Two, Extrapolate against a circular economy enablers/principles such as the Ellen MacArthur Foundation's ReSOLVE framework

Three, Evaluate both factors and identify intervention points for where your process/system is today and what the next iteration *can* be.

The goal is “whole systems thinking” beyond the immediate process or product.



ReSOLVE Framework

EXAMPLES

REGENERATE



- Shift to renewable energy and materials
- Reclaim, retain, and restore health of ecosystems
- Return recovered biological resources to the biosphere



SHARE



- Share assets (e.g. cars, rooms, appliances)
- Reuse/secondhand
- Prolong life through maintenance, design for durability, upgradability, etc.



OPTIMISE



- Increase performance/efficiency of product
- Remove waste in production and supply chain
- Leverage big data, automation, remote sensing and steering



LOOP



- Remanufacture products or components
- Recycle materials
- Digest anaerobically
- Extract biochemicals from organic waste



VIRTUALISE



- Books, music, travel, online shopping, autonomous vehicles etc.



EXCHANGE



- Replace old with advanced non-renewable materials
- Apply new technologies (e.g. 3D printing)
- Choose new product/service (e.g. multimodal transport)



The Case Studies

Identifying intervention points in pre-existing process

Wolwedans, Namibia – Eco Tourism

461 Dean St, Brooklyn – 32 Floor Modular Rental

Sainsbury's, UK – 2800 Assets





[Source: Wowedans](#)



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 **BAMB**
BUILDING AS MATERIAL BANKS



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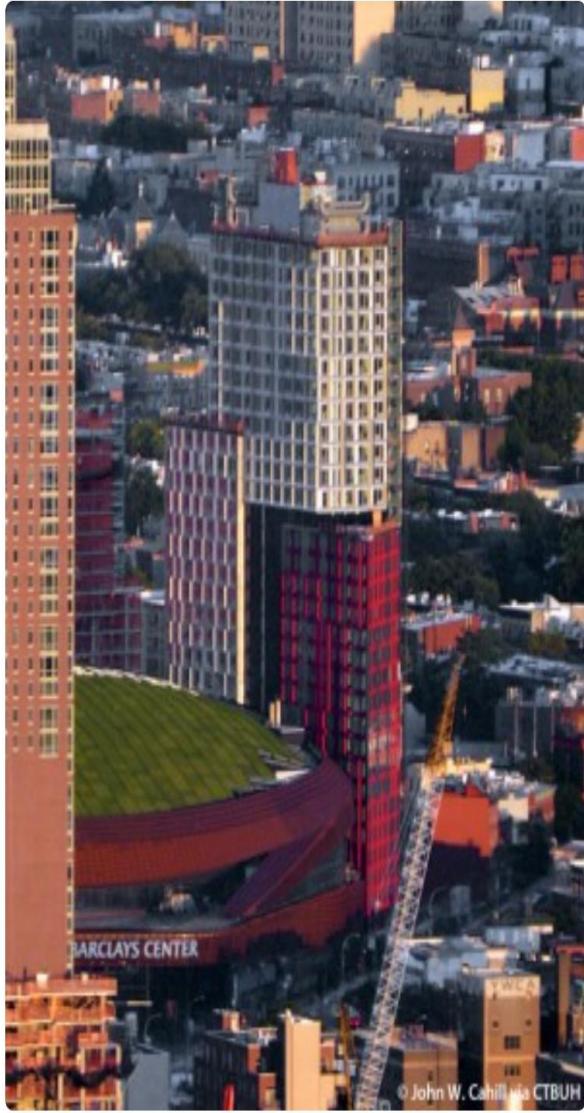
Wolwedans – simple construction, high circularity

- **ReSOLVE - Natural and social capital CAN result in revenue generation – REGENERATE**
 - 200,000ha reserve, self-sustaining, high quality, low-impact tourism, 4 other properties, regeneration, bio-diversity and resilience of the reserve.
- **Building construction - OPTIMISE / LOOP / EXCHANGE/ REGENERATE**
 - minimal environmental impact, simple, non-toxic materials, re-usable, reversible and modular construction. Disassembly of structures. Solar for lighting and hot water
- **Operations – REGENERATE / SHARE / OPTIMISE / LOOP / EXCHANGE**
 - shared centralised basecamp and infrastructure, sophisticated water pump house and filtration system, central office, stores and inventory, staff housing and a staff training academy, each operation feeds another; desert landscape necessitates a circular exchange of regenerating and optimising activities.
- **Wolwedans - High level circularity ReSOL_E in its building construction, operations and facilities management and social and natural capital**

HANDCRAFTED LOCALLY IN THE BROOKLYN NAVY YARD AS THE

TALLEST MODULAR BUILDING IN THE WORLD

The robust amenity offering at 461 Dean Street is comprised of a sky lounge and rooftop terrace, state of the art fitness center, yoga, and dance studio, work-from-home lounge with a catering kitchen and dedicated party room, a game room with billiards and ping-pong, and a children's playroom.



Click an image to view larger version.



Source: Skyscrapercenter.com

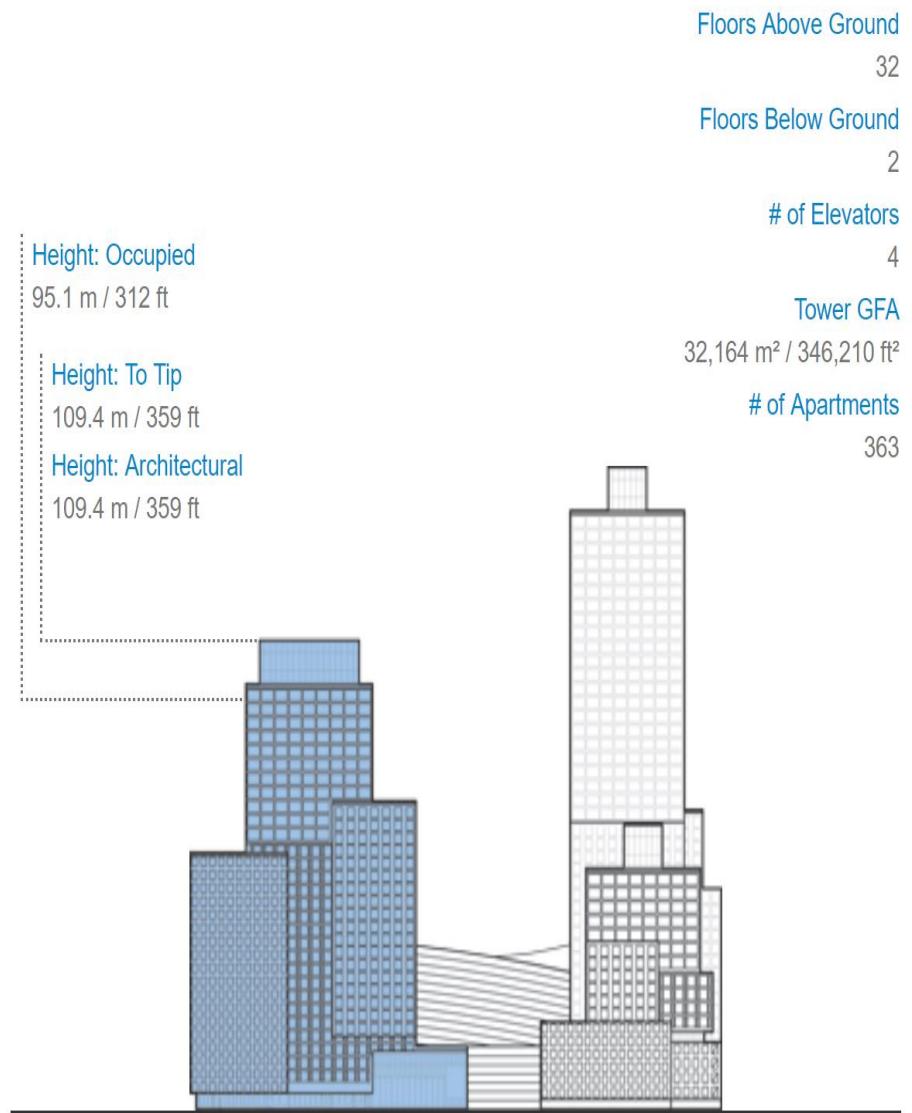
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- ***461 Dean Street - The ReSOLVE Framework and Design for Manufacture and Assembly (DfMA), (offsite and modular construction)***
- ***New business model – OPTIMISE / VIRTUALISE / EXCHANGE***
 - Factory vs Onsite.
 - prefab modules, fast time to market, reduced onsite waste, project and budget over-runs. Reduced transportation to/from the building site
- ***Community and social capital – REGENERATE / SHARE / OPTIMISE / EXCHANGE***
 - Non-jurisdictional union workers assembled 930 modules, resulted in 363 apartments in 23 layouts.
 - 50% units shared with mid-to-low income housing, regenerated a declining neighbourhood.
 - High-quality construction prevents decay or ‘undesirability’ of the building over time. LEED Silver certification,
- ***The construction process – SHARE / OPTIMISE / LOOP / VIRTUALISE / EXCHANGE***
 - Efficiently mapping systems in a clean dry environment
 - Simplified by using “IKEA-style” drawings vs construction drawings
 - Guaranteed fit first time (unlike in the linear version) LEAN frameworks for optimised activities – module/material delivery, staging and installation
 - Two parallel tracks (onsite/offsite) reducing time-to-market.
 - Modules shipped at night avoiding community disruption.

461 Dean Street - high level circularity elements towards ReSOLVE framework

Future iteration mirrors BAMB - Immense opportunities for asset owners, construction, suppliers and manufacturers. Everything-As-A-Service

- Framework for full circularity or cradle to cradle future state
- Modularity, disassembly and long term adaptability, end-of-life strategies
- Reusable materials, material passports and associated take-back systems by the suppliers of the facades, windows, etc.
- Closed loop material control
- leasing, performance and product-service systems, reverse logistics, appliance-as-a-service, lighting-as-a-service, etc.
- circular economy to scale within the building industry and supply chain



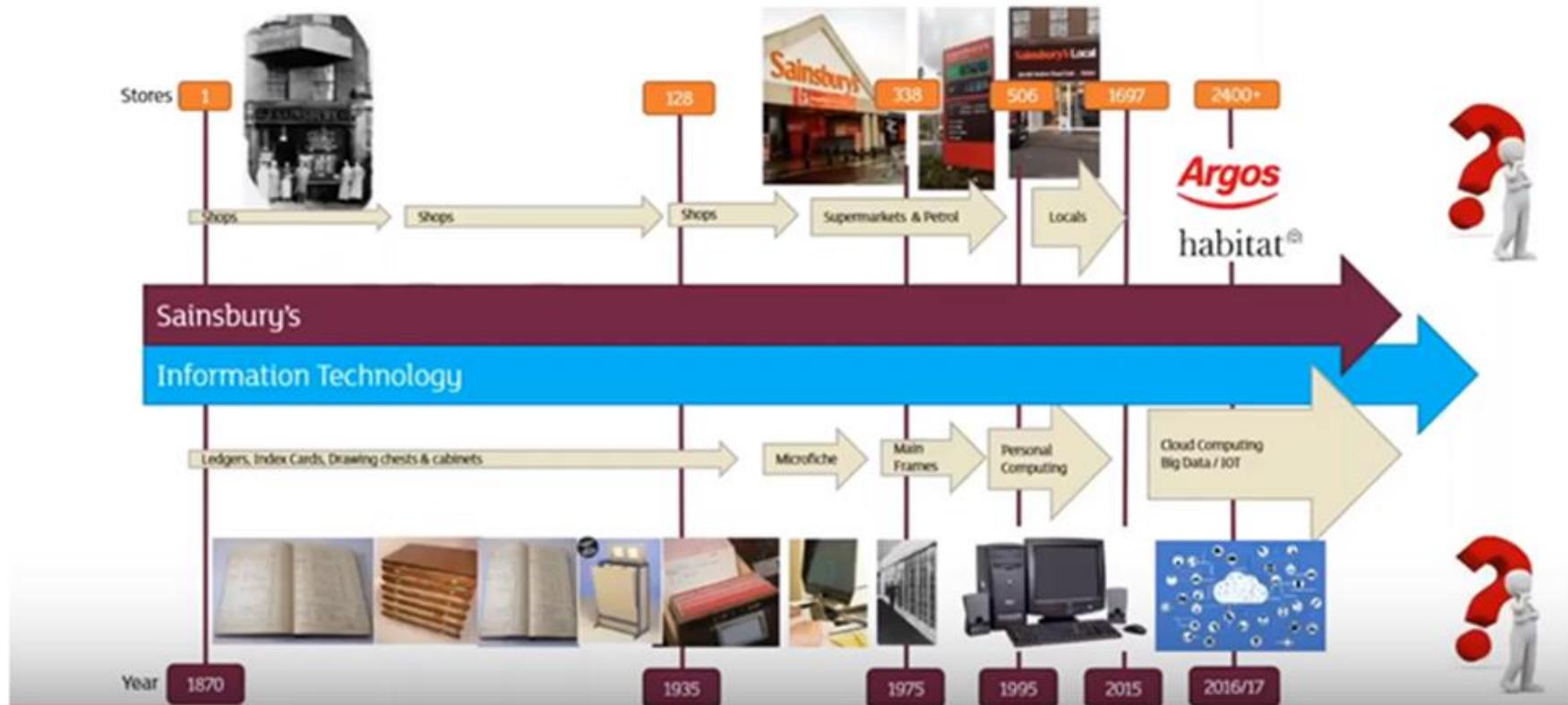
[Source: Wired.com](http://Wired.com)



Sainsbury's – 'One Property' 2800 physical assets - Digitised in a CDE!

- Sainsbury's digital estate – SHARE / OPTIMISE / VIRTUALISE / EXCHANGE
- Sainsbury's digitised all 2D drawings, data and information to a Common Data Environment. A 3-year endeavour fully utilizing BIM (*without* 3D models), CDE and a technology stack they already had.
- On a macro level they have a 'one property' view of all assets and realised 20% 'shadow space'. *And that's just the start of what's possible.*
 - Consider the possibility of Digital Twins - performance, exchange or sharing opportunities represented by utilizing IoT sensors consistently 'reporting back' real-time behaviour. Aggregating combined data across several assets show patterns of usage, footfall, temperatures, and much more, can lead to reconfigured workforce patterns and reduced energy consumption.
- A fascinating look at how they accomplished the project: [Sainsbury's Building and Maintaining a Digital Estate](#) and <https://bit.ly/2Srwy9m>

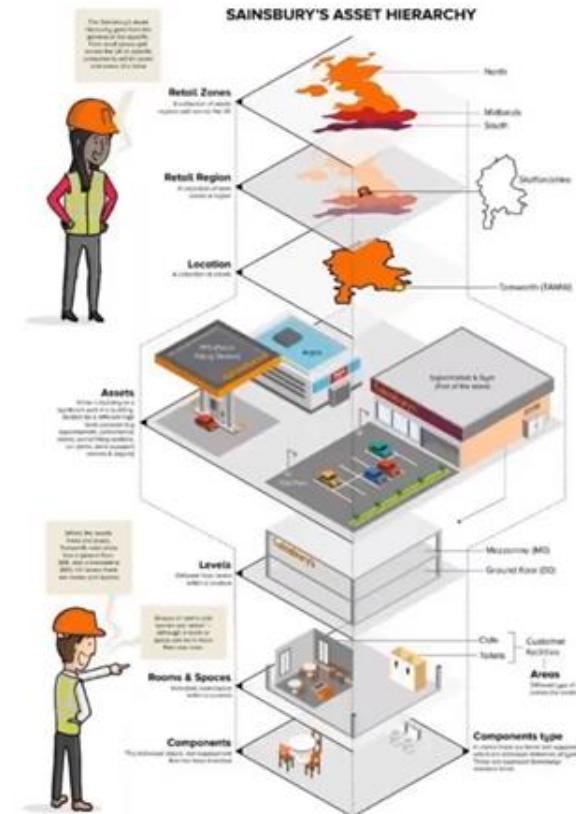
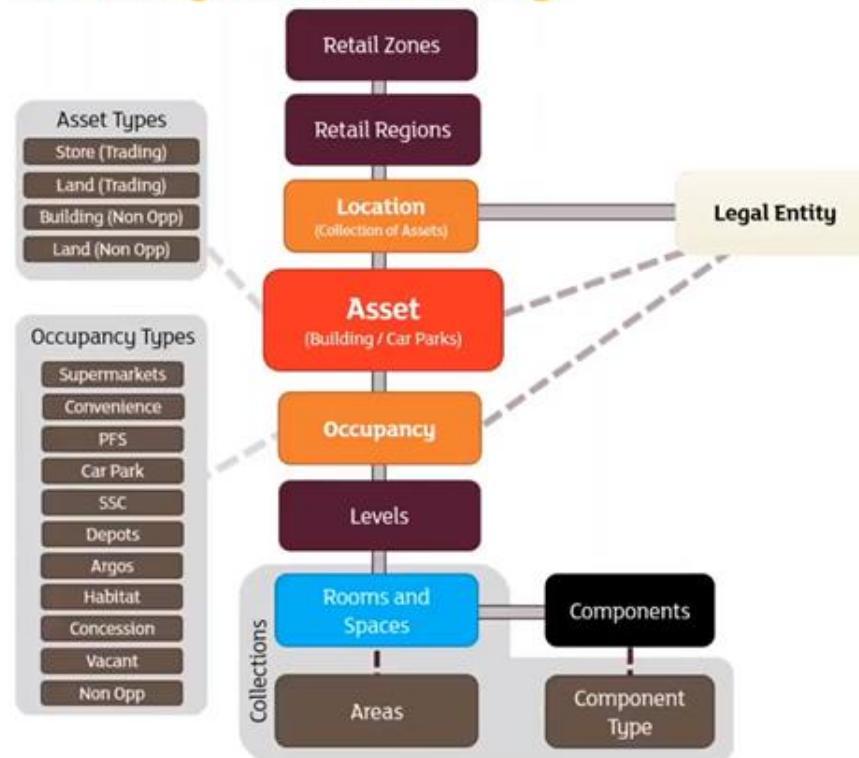
Information Management – A 21st Century Problem?



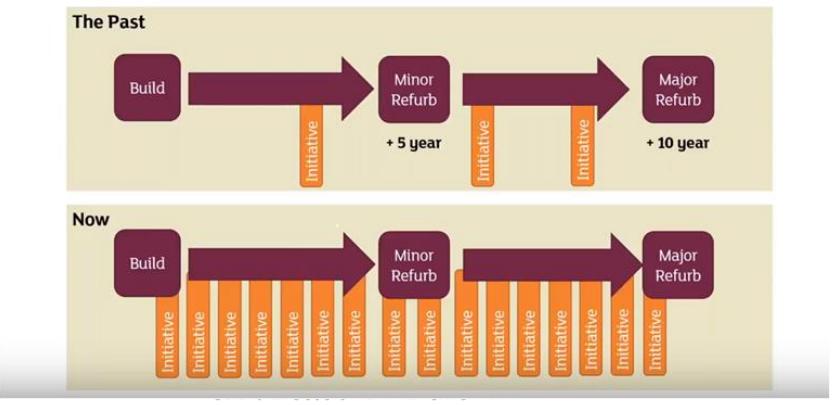
Source: [Sainsbury's Video](#)



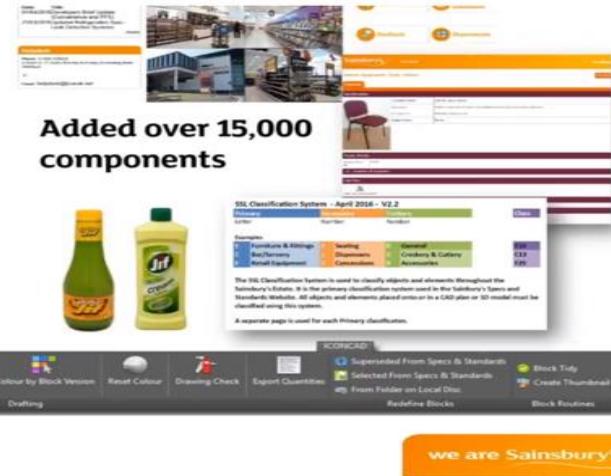
Sainsbury's Asset Hierarchy



Store development life-cycle



Source: [Sainsbury's Video](#)



What have we done?



Source: [Sainsbury's Video](#)



Conclusion

- Is the built environment close to achieving Circularity?
Clearly not. But it's an exciting time for innovation in an industry that's ripe for disruption.
- Frameworks help practical implementations into circularity but context is very important for each case study.
- Identifying intervention points becomes easier when existing circularity elements are identified and used as a jumping off point. When you get here, don't re-invent the wheel. And finally, think in whole systems, not parts of a system.
- Two great new circular projects:
 - <https://circl.nl/themakingof/en/>
 - [Bloc.nl, The Dutch Mountains](https://www.bloc.nl/the-dutch-mountains)

Thank you !



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chains) towards the
circular economy
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6-Point Plan for interventions within:

1. secure executive commitment/
sponsorship, budget and task group
2. ensure understanding of CE – conduct
an audit or benchmarking exercise
against built-for-purpose circular
designed projects for clarity and
signposting
3. conduct PESTLE/SWOT analysis for
market gaps/goal identification and
align with capabilities, tools, and
business strategy
4. identify low hanging fruit for early (and
easy) wins building commitment
internally/externally
5. CE programme integration that is
reviewed, measured, revised and
reported on
6. publicise efforts through marketing,
networks and partnerships.
 - Paper has more info: <https://bit.ly/2Srwy9m>



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