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11th May 2022 - 10.00am to 4.30pm Atkins, Nova North Bressenden Place, London

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# Decarbonomics and the Digital Twin – understanding and visualising a lean, green campus



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# Carbon

# Decarbonomics

Data

**Digital Twins** 



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# Decarbonomics

## Data

# **Digital Twins**



#### Why Carbon Matters



Understanding the carbon challenge – existing stock



Understanding the carbon challenge – future challenges



Understanding the carbon challenge – the journey is key



# **Decarbonomics**<sup>™</sup>

Powered by Carbon Data Insights

# Buildings



Decarbonomics makes carbon visible and removes carbon cost effectively across our client's built estates. It does this through providing an end-to-end service bringing together our people, data, processes and tools to decarbonise existing buildings in the commercial, education and light industrial sectors. This is based on a simple three step approach:

- 1) Benchmark: developing a carbon baseline.
- 2) Roadmap: designing a cost-effective carbon reduction pathway.
- 3) Deliver: implementing our carbon reduction solutions, from behaviour change to building retrofit interventions, and measuring progress across the portfolio & asset lifecycle.

This is all underpinned by **Carbon Data Insights**, an ecosystem of open-source benchmark databases, supplemented with SNC-Lavalin's own building data library to enrich & enhance the data.

Powered by Carbon Data Insights





#### **Key benefits**





A whole systems-based approach to cost effective decarbonisation with clear visualisation of outputs

Enterprise level reporting using limited data, utilising a combination of our data library and supplied data

Healthier and more resilient portfolios

Empowered decision making - Commercially flexible innovative procurement options e.g. outcome-based models

Speed of outputs - Quality control of retrofit and operation



## Our Delivery Process











## CASE STUDY: Dashboard and DWP Model – Benchmark Stage

We have benchmarked 50 properties for the DWP across the United Kingdom. Data has been collected and where unavailable our carbon data insights library is used to enable a holistic view of the estate as it stands today. It visualises how the estate is performing and has the ability to go into granular detail using filters by region or building age & typology.



## CASE STUDY: Dashboard and DWP Model – Roadmap Stage

The Roadmap stage summarises the various interventions, using scenario testing to develop a bespoke roadmap.



## CASE STUDY: Dashboard and DWP Model – Deliver Stage

The Delivery stage visualises the carbon reduction interventions chosen and the cost associated across the DWP portfolio lifecycle.



## **Other Case Histories**



#### **Net Zero Leiston**

Atkins were part of a working group of experts from the UK and across Europe, with the initial aim to create a route map showing current levels of emissions and what is required to reach Net Zero at a town in England, Leiston. The study considered the emissions from four key categories: buildings, transportation, agriculture and land use.



MOD – DE&S

Decarbonomics will be conducting energy data analysis on the DE&S building portfolio including carrying out site surveys and Net Zero reports in order to achieve their Net Zero targets. In addition to this task, a future roadmap and programme will also be prepared.



#### **Government Property Agency**

SNCL are the strategic Net Zero Partner for the UKs Government Property Agency 450 building portfolio, with this work forming the basis of the Decarbonomics service platform. Our reporting dashboards compare projected and actual savings (carbon, energy and monetary) with the NZ Programme Business Case.



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## Talking about data



Data is the new oil – it is the single most valuable commodity there is.

#### What data is there in the built environment?

- Point Clouds
- Survey Data
- Element Quantity & Metadata
- *GIS*
- Site Context
- Cost Modelling
- Analysis Results

## **Digital Twin Approach**

Application of "Smart Campus" approaches typically fall within five broad areas:

 Placemaking - Planning & Design: a well-planned city or project is at human scale and includes a digital dimension;

• Evidence & Operation - Data: Use of real time data or simulations to inform decisions in real time;

• **Infrastructure** — Internet of Things (IoT) - Sensor laden, interconnected and interactive systems;

• **Environment**: High performing, energy efficient, more sustainable and resilient built environment;

• **Integration**: The campus as a Platform where all data are captured and integrated in a single place.



## Energy data



Centre for Digital Built Britain, University of Cambridge

#### Infrastructure data



Centre for Digital Built Britain, University of Cambridge

## Transport data



Centre for Digital Built Britain, University of Cambridge

#### Built environment data



*Centre for Digital Built Britain, University of Cambridge* 

### Scale and context



#### Placemaking: Big Data Visualisation



Built Property Bungalows = 3.4% | Semi-Detached = 18.8% | Detached = 8.2% | Terraced = 37.8% | Flats = 31.0%
 Filters

 Town/ City

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1.22% | 1900 to 1916 = 0.3% | 1919 to 1929 = 3.3% | 1930 to 1939 = 4.4% | 1945 to 1994 = 33.6% | 1955 to 1964 = 3.9% | 1965 to 1972 = 8.7% | 1973 to 1982 = 9.4% | 1983 to 1992 = 10.0% | 1993 to 1999 = 4.7% | 2000 to 2009 = 7.0% | 2010 to 2019 = 6.8% [Income Flag



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#### Placemaking: Big Data Visualisation

Points of Interest nearby Victoria Station – 05 minutes



Brand

#### Placemaking: Microclimate Visualiser



#### Placemaking: Microclimate Visualiser



## Infrastructure: Data Mesh: Institute of Health and Wellbeing



## Human Centred Design





**1.Lighting** – improving daylight provision and increasing the quality of artificial light.



**2.Ventilation and air quality**– increasing ventilation and reducing volatile organic compounds and carbon dioxide.



**3.Thermal comfort** – the temperature of the working environment, including an individual's ability to control it



**4.Noise and acoustics** – covers environmental noise (e.g. roads), white noise (e.g. air conditioning systems) and pink noise (e.g. human voice frequency).



**5.Interactive office** – the level of control an individual has over the office environment, for example, control of lighting, ventilation and physical desk set-up.



**6.Visual / biofilia** – plants, nature, a view of the outdoors, interior colours and materials.

## Human Centred Design

Q: Please select up to THREE spaces which you feel would be most important in supporting work interaction



Fig1. Space for work related interaction - All staff



## Placemaking: Lighting Visualiser



## Placemaking: Lighting Visualiser



#### Infrastructure: Sensor Visualisation



#### Infrastructure: Sensor Visualisation



#### Evidence & Operation: VR Training



## Evidence & Operation: VR Training



## **Digital Twin Approach**



Element 0 Point cloud

#### Element 1 3D model

Element 2 Connect to persistent data and BIM

#### Element 3

Enrich with real-time data

#### Element 4

Two-way integration and interaction

#### Element 5

Autonomous operations and maintenance





PlymouthUn\_Davy\_P009.3dm (13 MB) - Rhino 6 Commercial - [Perspective] - 印 × File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Panels Help Command: \_Delete Command: Grasshoppe Grasshopper - PlymouthUni\_Visualisation\_ConversionScript4\* × ----Command: File Edit View Display Solution Help PlymouthUni\_Visualisation\_ConversionScript4\* Standard CPlanes Set View Display Select Viewport Layout Visibility Transform Curve Tools Surface Tools Solid Tools Mesh Tools Render Tools Params Maths Sets Vector Curve Surface Mesh Intersect Transform Display Kangaroo2 Elefront Human 0000000 Perspective |k ." braries 🔯 Help 0 44 Material Linetype 138% 💽 · 💿 · 🌽 ê 🛇 🔷 🔇 🕥 🥥 Continuous Continuous Continuous Continuous Continuous Continuous Continuous True:STACK,False:Layout 12 Continuous Continuous 0 0-0 Toggle True Continuous 20 Continuous 00 Continuous BAKE ROOMS Continuous Continuous 7.2 Continuous Continuous Continuous Continuous Continuous Continuous  $\approx$ Continuous 0,0 1 (3 Continuous Activate Continuous IM Continuous 1000 Continuous Continuous Toggle False Continuous Continuous Continuous This is used for error checking Continuous Continuous 423 PlymouthUni\_Davy\_P009\_Storeroom\_803 Continuous 424 PlymouthUni Davy P009 Non-UsableSpace-Ducting 8992 Continuous 425 PlymouthUni Davy P009 Storeroom 816A Continuous 426 PlymouthUni Davy P009 Boiler-Meter-TankRoom 899B Continuous Continuous 427 PlymouthUni Davy P009 Boiler-Meter-TankRoom 999 Continuous 428 PlymouthUni Davy P009 Boiler-Meter-TankRoom 999B Continuous 429 PlymouthUni Davy P009 LiftMotorRoom 999C Continuous 430 PlymouthUni\_Davy\_P009\_RadioRoom\_901 Continuous 431 PlymouthUni Davy P009 Stairway-Lift-Landing 997 Continuous 432 PlymouthUni Davy P009 PlantRoom 999A Continuous Continuous Continuous Perspective Perspective Front Right -0-

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# Thank you Any questions?

