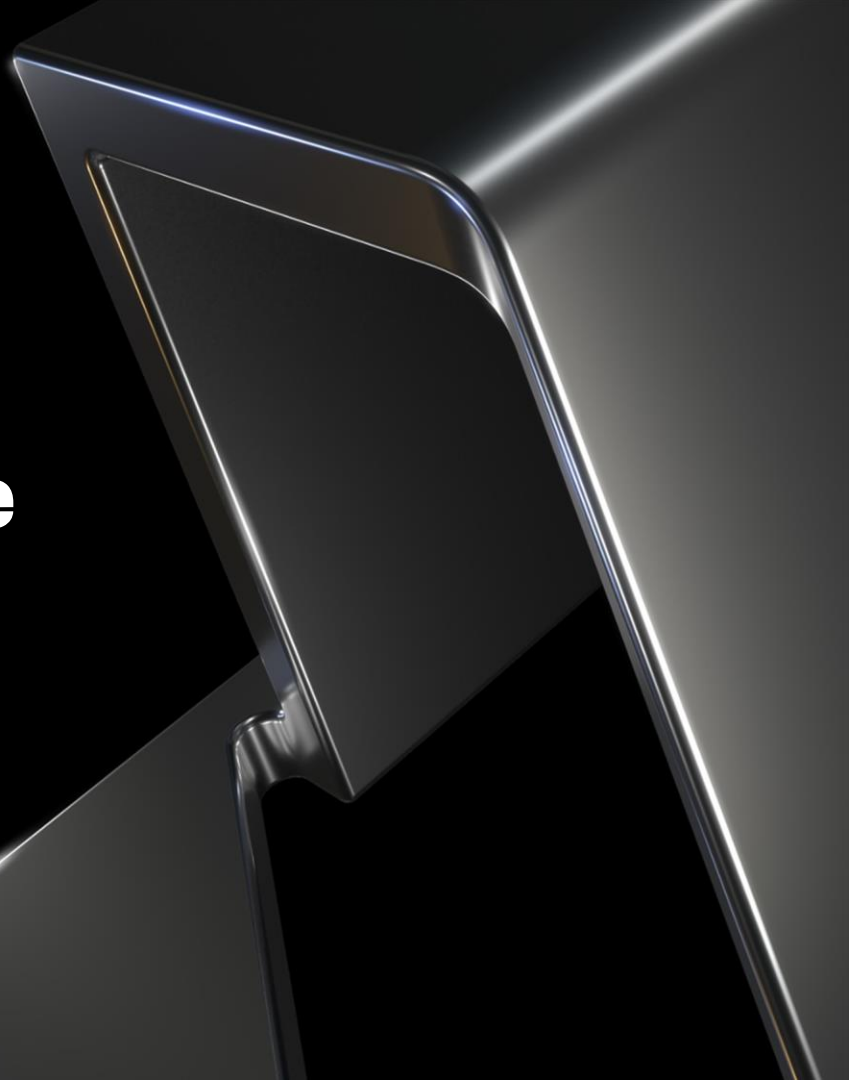
AUTODESK UNIVERSITY

Using Technology and Software to Create More Sustainable Designs



May Winfield

Global Director of Commercial, Legal and Digital Risks
Buro Happold | @Buildlaw_Arttea

© 2021 Autodesk, Inc.

Speaker: May Winfield

Global Director of Commercial, Legal and Digital Risks, Buro Happold

- Senior construction lawyer of over 17 years' experience
- Speaks at events worldwide and author of multiple articles on construction technology
- Led drafting of legal guidance on the international standards, ISO 19650, and an ISO19650-compliant Information Protocol document
- Core Team Member of both 4D Construction Group and ZERO Group (created to progress sustainability)
- Working Group member of the CDBB Digital Twin Roadmap and Digital Twin Toolkit
- Co-founder and chair of BIM4Legal
- UK BIM Alliance Ambassador

BuroHappold – Technology and Sustainability

Taking it seriously

Expo 2020

Sustainability Pavilion promoted sustainable tech and design

Tencent Dachan Bay

Computational optimization of wind and solar and integration of sustainable design

Santa Monica City Hall

Meets the Living Building Challenge, most stringent green building rating system

Driving Net Zero

Developed targets, gathering data and inform policy to achieve net zero carbon

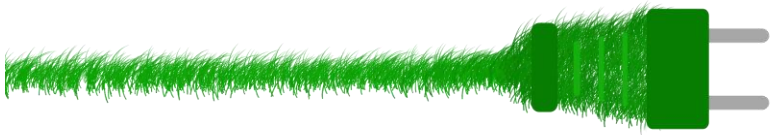
Why It Matters

New building construction "is responsible for more than 2.5 gigatons of CO_2e globally"

McKinsey, July 14 2021

The Climate Emergency – Construction's Contribution

- Buildings and construction account for 40% of energy-related CO_2 emissions
- Cement accounts for 8% of global emissions
- Construction industry accounts for 11% of all greenhouse gases globally



"When we asked 100 senior construction executives what trends they expected to accelerate due to the COVID-19 crisis, 53 percent cited sustainability"

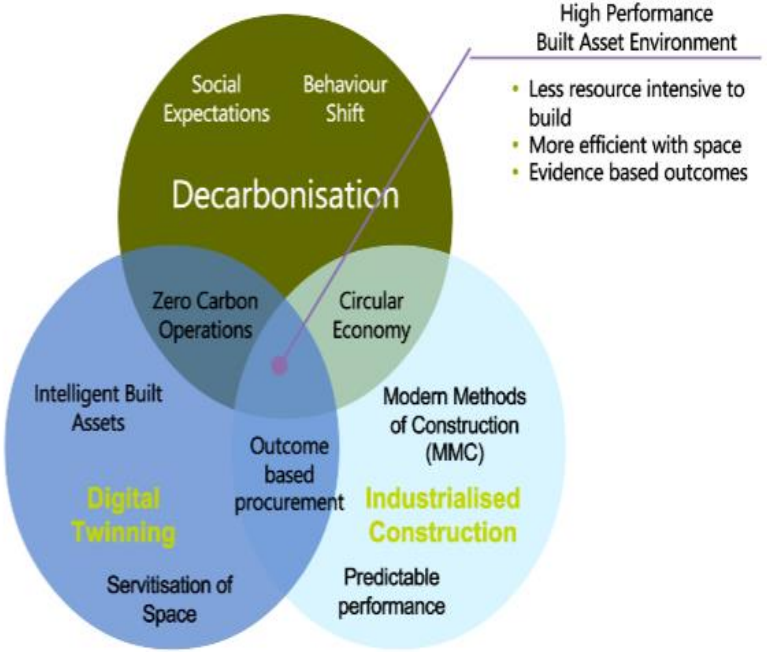
McKinsey, July 14 2021

Technology and Processes

(some examples)

Some key technologies

- BIM and Information Management
- DfMA
- Smart Buildings
- Digital Twins
- AI/Machine Learning
- Automation
- Toolkits and Dashboards
- Alternatives to traditional concrete



Digital Twins Toolkits

Use of generative design and game engine technologies as pathways to net-zero communities

- Smart energy digital twins toolkit
- Streamed to two access platforms for secure, confidential multi-user access
- Incorporates real-world datato support:
  - Intelligent selection and validation of domestic heat network solutions
  - Understand choices and tracking technologies to get to net zero carbon
- Analysis of vast quantities of data points
- Full detail at: https://www.cdbb.cam.ac.uk/news/dt-toolkit-making-business-case-dt

Example of Smart Energy Digital Twin

Example of Digital Twin platform with insight infographics

Building Performance Dashboard

Facilitates achieving overall net zero carbon

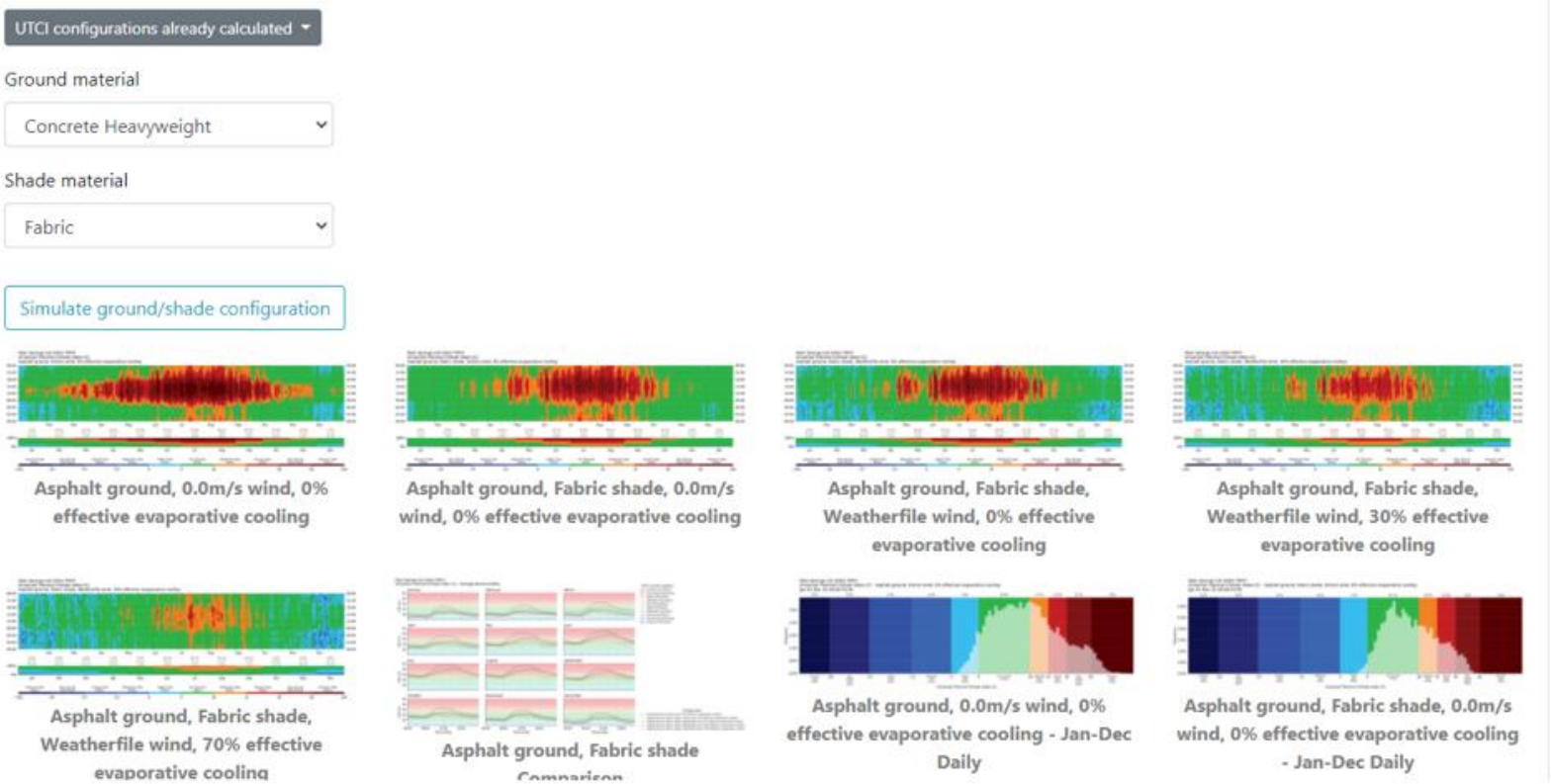
- Central reporting on modelled and measured energy data i.e.
  - Energy consumption
  - Operational carbon
  - Embodied carbon
- Collects data centrally for all projects
- Using technology for uniform
  - Data collection
  - Data analysis
  - Communication tool

Climate Toolkit/Dashboard

Helps design in climate resilient manner

- Shortens time taken to generate a climate or comfort report from 1 day to 10 minutes
- Generation of resources at click of a button
- Tech stack includes database, web app, simulation apps and reporting engine
- Example of use:
  - Upload a weather file
  - Generate some standard summary charts
  - Run full simulations to determine pedestrian thermal conditions under varying strategies
  - Use to assess/mitigate climate challenges

Example of Climate Dashboard



Example of Climate Dashboard

Details Heatmap Diurnal Windrose UTCI Download

- **Country:** USA
- **State:** CA
- **City:** Palm Springs Intl
- **Station Id:** 722868
- **Source:** TMY3

Köppen-Geiger climate

- **Classification:** Csa
- **Description:** Hot-summer Mediterranean climate

BHoM LCA Toolkit

BHoM = Buildings and Habitats Object Model

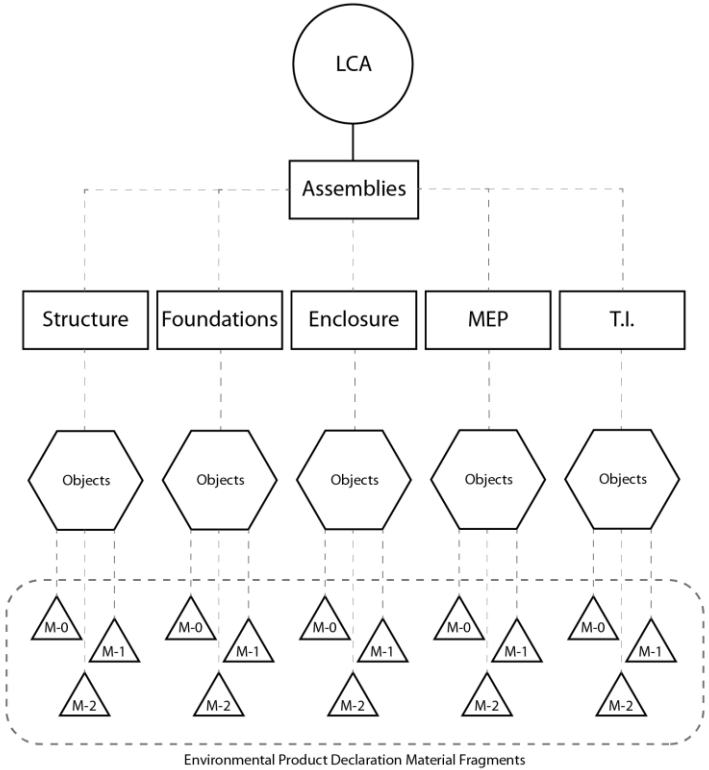
LCA = Life Cycle Assessment is comprised of several scope objects, which contain their respective building elements and materials

- Modelling methodology used to quantify carbon emissions and other environmental impacts of a process through life cycle stages
- Allows party to assess carbon on early models
- Informs early design decisions to minimise environmental impact
- Allows an analysis of the elements within an existing structural Revit model
- Find out more at: https://github.com/BHoM/LifeCycleAssessment_Toolkit/wiki

Toolkit Logic

SUSTAINABLE CODE AT SCALE

The Buildings and Habitats object Model

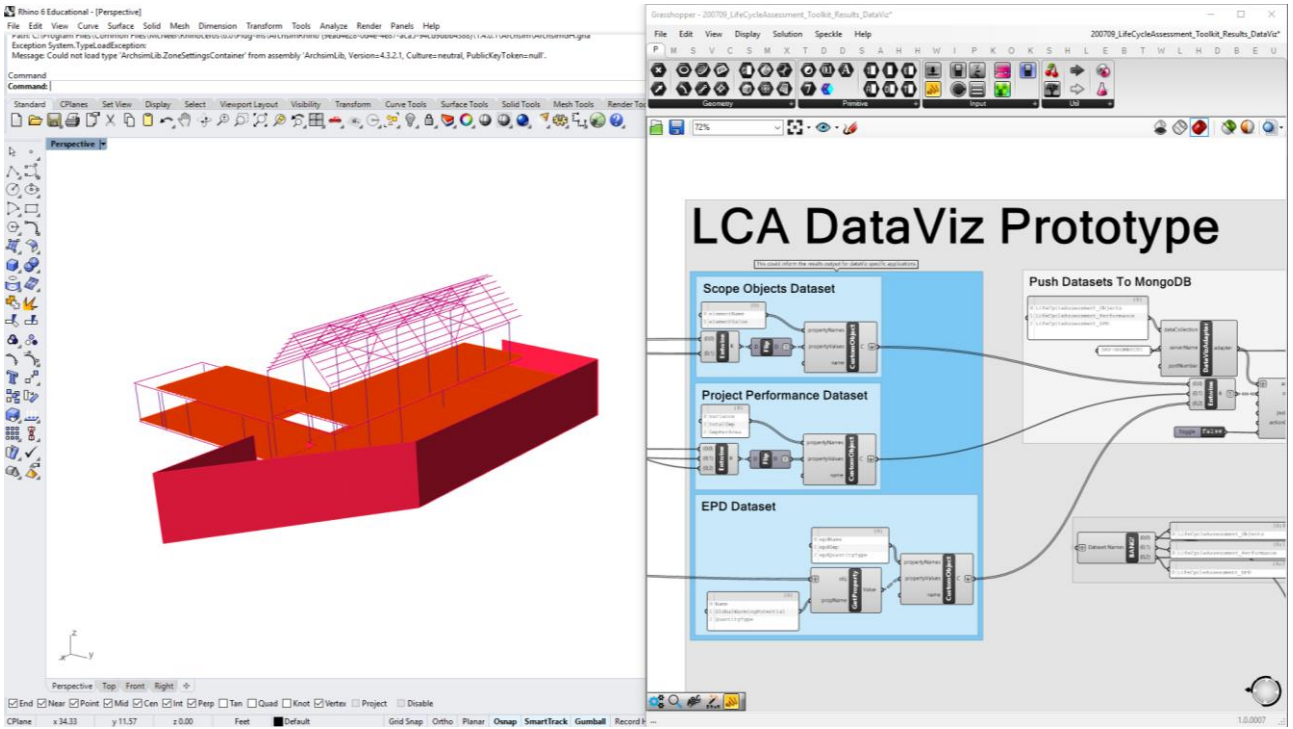


- The LCA Toolkit is built upon the foundational principles provided by the Carbon Leadership Forum Best Practice Guide: http://www.carbonleadershipforum.org/wp-content/uploads/2018/06/CLF-LCA-Practice-Guide-v1.0-2018-06-28.pdf
- Structured Scope Objects allow for an organised, and systematic approach to compiling an LCA. In contrast, one could easily neglect to assess certain building elements within their LCA.

Sample Results

SUSTAINABLE CODE AT SCALE

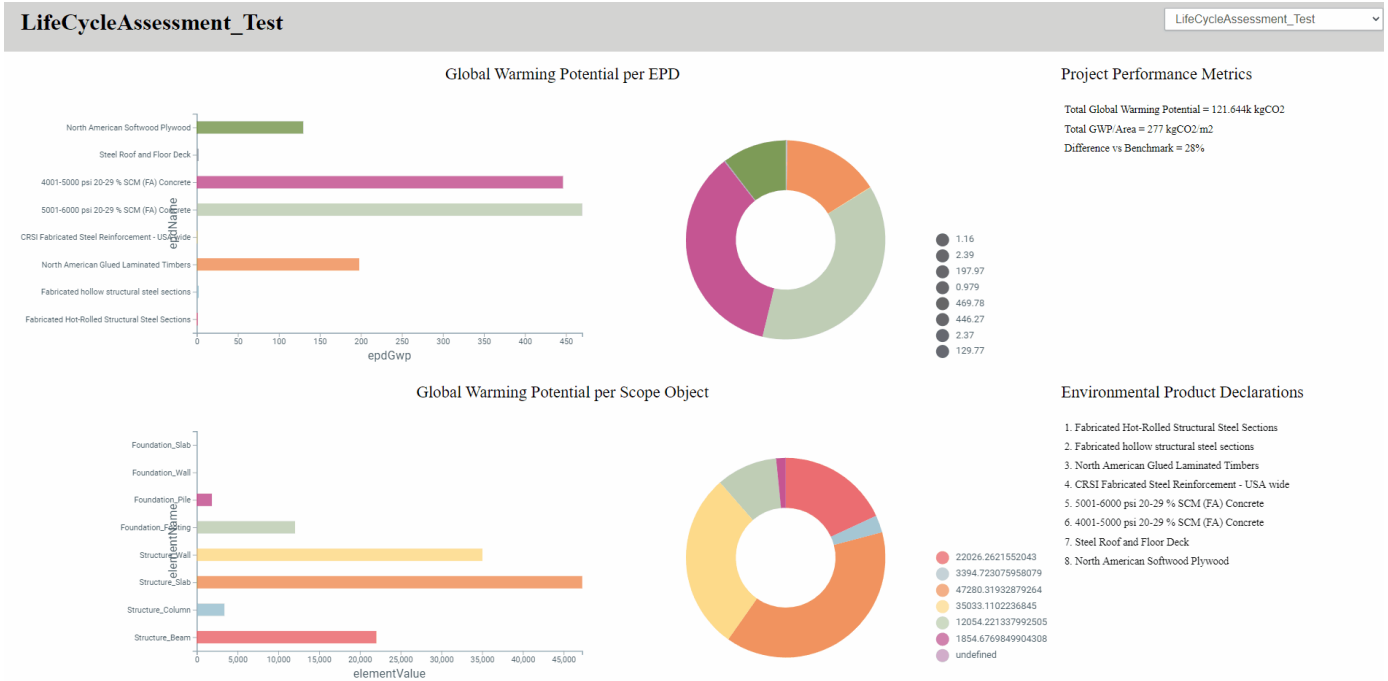
The Buildings and Habitats object Model



Sample Results

SUSTAINABLE CODE AT SCALE

The Buildings and Habitats object Model

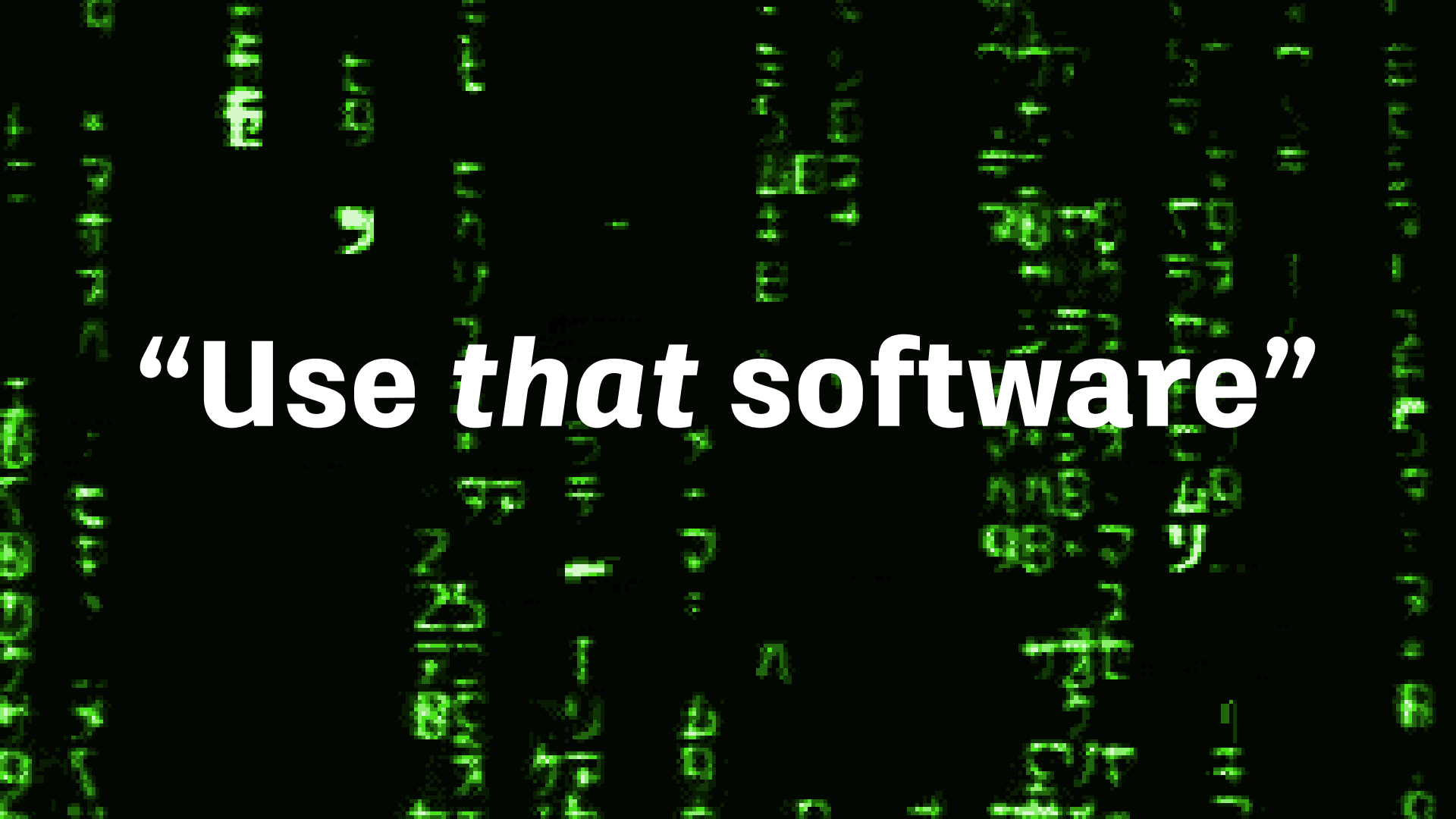


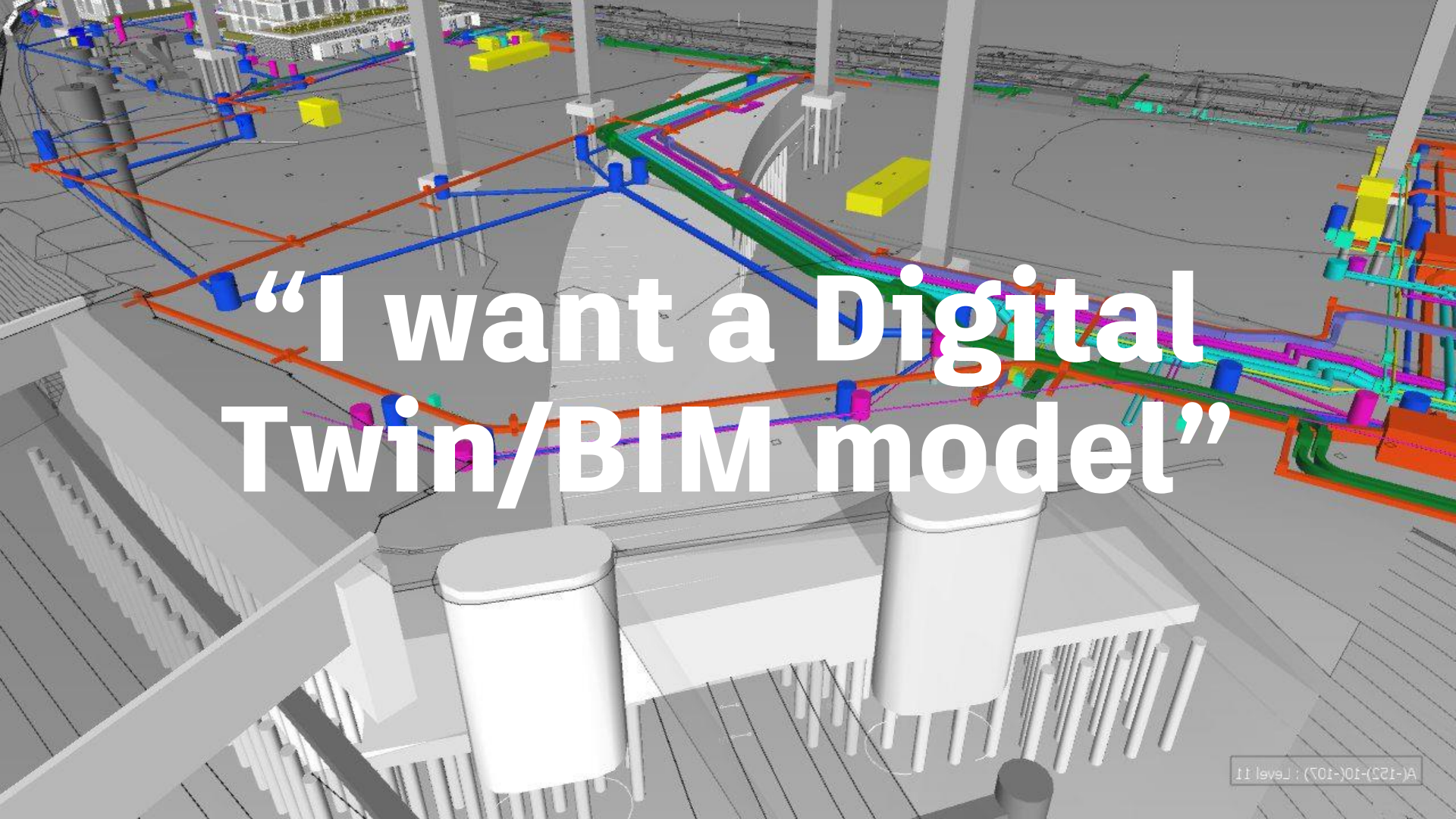
Contracts and Documentation

I LOVE
YOU

D. AUTORIDAD
JUNTA ANDALUCIA

“Make it sustainable”


“Use *that* software”


“I want a Digital Twin/BIM model”

“Achieve these KPIs”

“Achieve Net
Zero Carbon”

“Expert/Best in Class”

“That’s not my responsibility”

What Does This Mean In Practice?

The issues and how to deal with them

Clarity of specifications/scope – who does what, when and how?

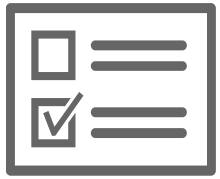
- Split of responsibilities between project team
- Software specifications (tying in with intentions)
- Reasonable and achievable requirements/scope
- Do some…stuff
- Does the Client know what it wants?

Clarity in (and liability for) the results

- Basis of design/findings and disclaimers
- Strict and uninsured promises
- Unlimited scope and reliance
- Compliance with changing standards and regulations

Summary of Some Key Risk Management

Exclusions and Limitations



Clear Scope and Intended Results

No Gaps in Responsibilities

Internal Processes and Documentation

Working Together

Organised Systems

Creating effective internal systems

what, where and how

Clarity of documentation and processes

- Standard templates, scope and processes
- Understanding of services and processes
- Guidance, checklists and training

Push and Pull

- From senior management
- From those carrying out and developing services
- Organisation published and expressed ethos, plans and actions

Summary of how to work out what you need

Start with a blank sheet of paper...

What

Process/Tasks

What is actually wanted and what is needed

Who

Allocating

What could go wrong and who should bear the roles/liability

How

Reducing Issues

What processes, records and skills to clarify and reduce risks

Risk

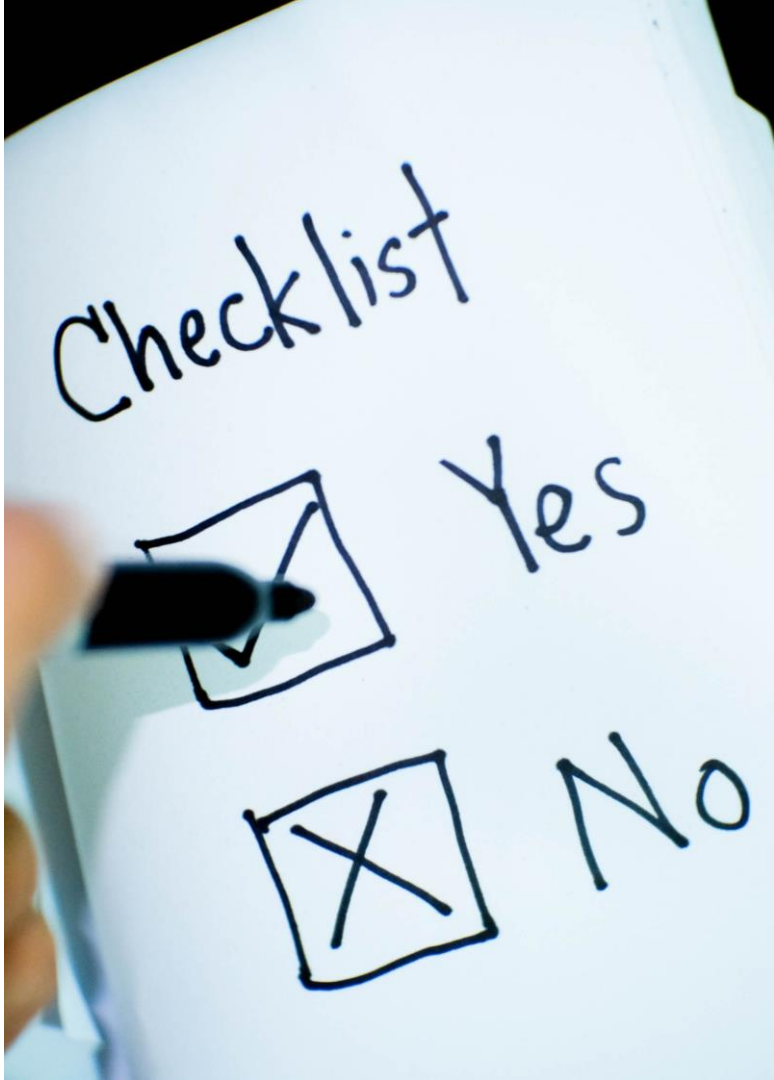
Analyzing

How likely are the risks and are they big or small

When does this matter?

(Answer = all the time)

- At the outset
- Throughout the project
- Designed with parties and users in mind
- Agile and practical
- Clarity of responsibilities and outcomes

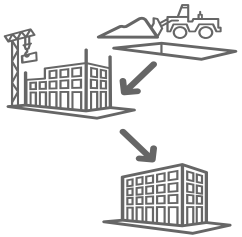


Ethos

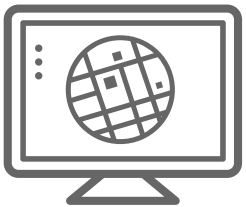
Summary of establishing ethos

Clarity and buy-in

Vision



Purpose and Targets



Organisation-Wide Steps

Buro Happold's Published Targets

Change requires real commitment

Reduce our own operational carbon emissions by 21% by 2025 and aim to be net zero carbon from April 2021 by offsetting residual emissions

Design all new build projects to be net zero carbon in operation by 2030

Reduce embodied carbon intensity of all new buildings, major retrofits and infrastructure projects by 50% by 2030

Some lessons learnt

(From those who are in the thick of it)

“It’s not that I’m so smart. It’s just that I stay with problems longer.”

Albert Einstein

- Encouraging/Ensuring adoption
- Technology is an enabler and tool
- Technology is not a panacea
  - Some tasks will still be time consuming
  - Human input is fallible
  - No sole technology/software solution
- Awareness of skillset limitations
- Collaboration is key

Communication

Final Summary

- Multi-pronged approach
- Technology and Measuring
- Data and Process
- Mindset and Policy
- And don’t forget document clarity…
  - Targets and Aims
  - Responsible for
  - Not responsible for
  - Mind the gaps

“Demand for sustainable buildings is increasing, doubling every three years”

Emmanuel De Giacomo

Autodesk University 2020 Article

AUTODESK UNIVERSITY

Autodesk and the Autodesk logo are registered trademarks or trademarks of Autodesk, Inc., and/or its subsidiaries and/or affiliates in the USA and/or other countries. All other brand names, product names, or trademarks belong to their respective holders. Autodesk reserves the right to alter product and services offerings, and specifications and pricing at any time without notice, and is not responsible for typographical or graphical errors that may appear in this document.

© 2021 Autodesk. All rights reserved.