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Modelling Net Zero interventions using a spatial planning tool

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Newcastle City Council

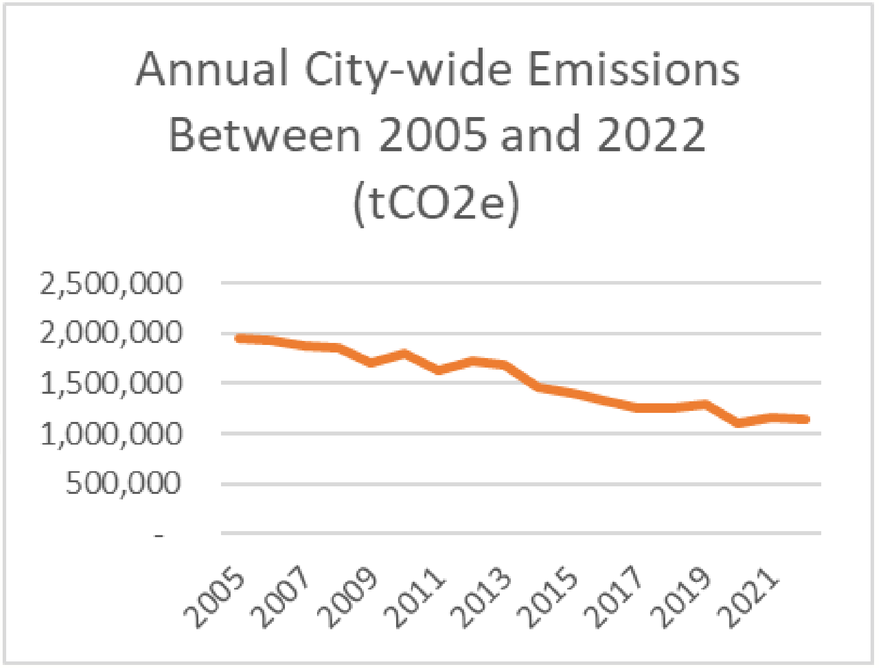
Introduction: David Trousdale

- Principal Advisor – Climate Change & Sustainability
- Areas of responsibility:
  - Measuring progress against the 2030 Net Zero Action Plan
  - Providing strategic direction on all things climate related
  - Managing the quarterly Net Zero Board
  - Coordinating the Climate Change Forum
  - Providing targeted capacity and capability focused on delivery in key areas including heat networks and community engagement
- Also a specialist in EV charge point infrastructure

Climate change and Net Zero – Newcastle context

- Newcastle, alongside the city's anchor institutions, declared a climate emergency in 2019 and launched its Net Zero 2030 Action Plan in 2020.
- Newcastle emissions can be broken down into three categories. Energy makes up 65% of the city's emissions, followed by Transport at 30%. Waste and other industrial process, land use and livestock makes up the remaining 5%.
- Since 2019, when the city declared a Climate Emergency, Newcastle has reduced its city-wide scope 1 & 2 emissions by 11% from 2019 - 2022, this is a reduction of 146,918 tonnes of CO2e, which would be equal to driving a car for 652,541,907 miles.
- The city recognises that there are a number of challenges and that more needs to be done to achieve Net Zero by 2030.

Newcastle has been recognised internationally as a leader in Net Zero



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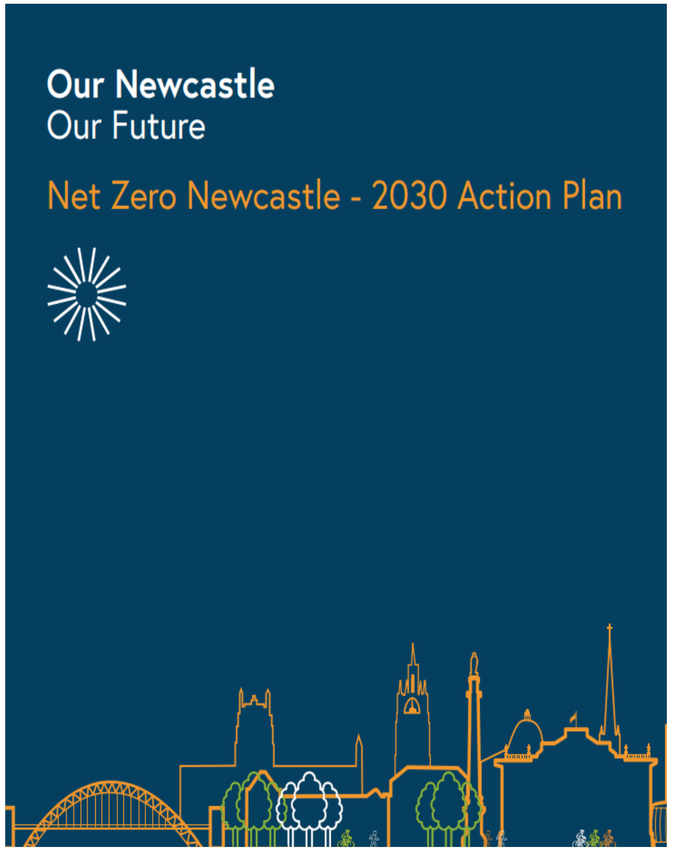
Our Net Zero 2030 Action Plan



Three key thematic areas

Energy

Transport

Adaptation & Sustainability

93 key actions

68% of actions completed, transitioned to business as usual or superseded

11% citywide emissions reduction since 2019

42% citywide emissions reduction since 2005

2023/4 corporate emissions inventory

28% Scope 1

7% Scope 2

65% Scope 3

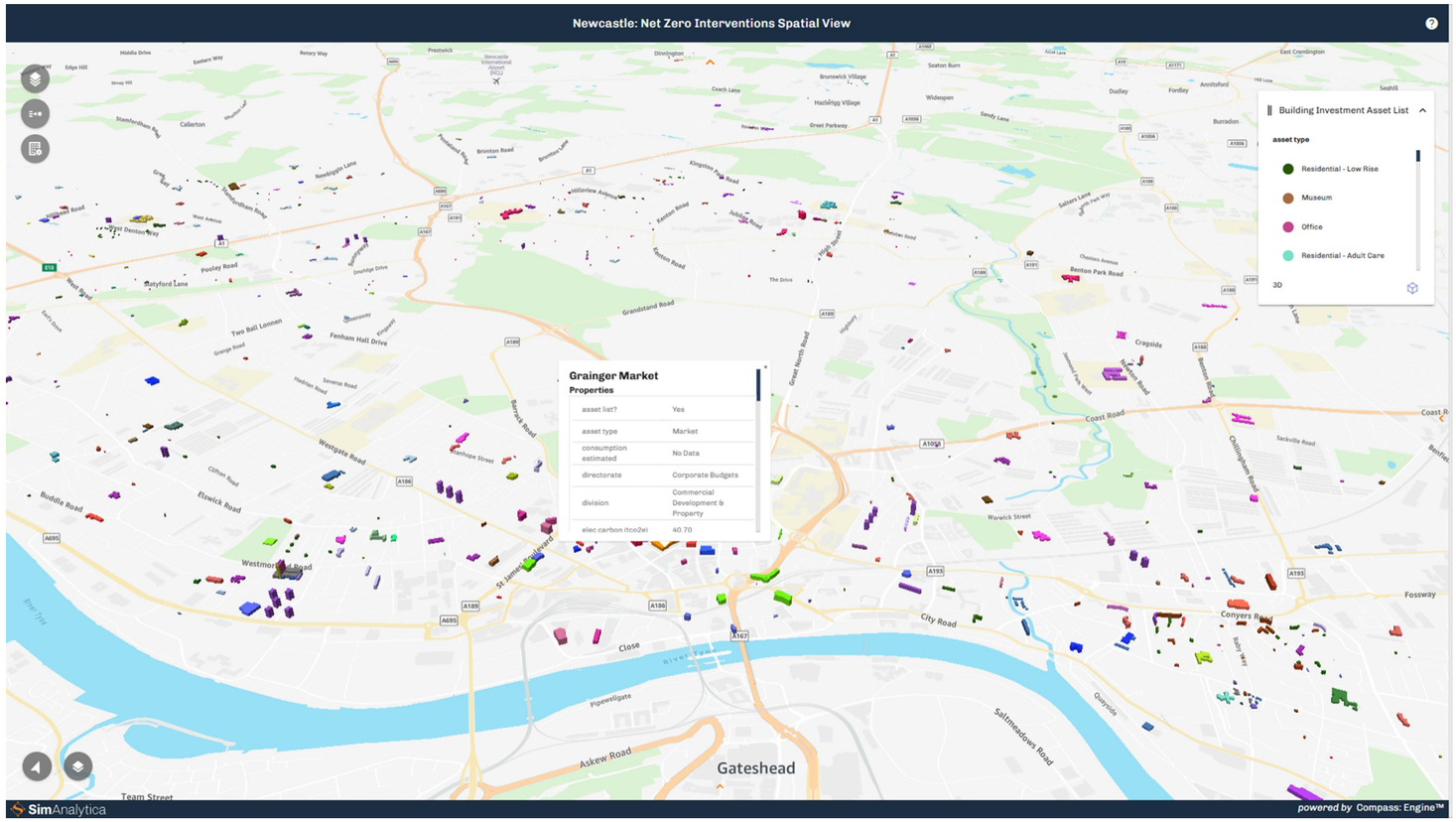
A key gap in our capabilities

- As a city we conduct two carbon inventories: citywide and corporate.
- The key challenge is marrying up – how does a decarb intervention at a building level feed into a citywide inventory.
- A further challenge is how do we evidence interventions can deliver cost and emissions savings **AT PACE.**
- Even delivering an outline business case and the preamble to that is resource intensive.

Is there a tool that can ingest our bottom up energy and emissions data, assigned to buildings, and enable us to run different interventions to demonstrate the impact and ultimately make better quicker decisions?

The Net Zero interventions spatial planning tool – proof of concept

- Models different Net Zero interventions in the built environment.
- Involves taking buildings and other stationary assets and then combining with different data sources
- Enables decision makers to understand the impact of interventions on cost, energy and emissions.
- 19 interventions are included (solar pv, heat pumps, BESS and heat networks).
- Tool is able to calculate the cost to decarbonise based on the interventions.
- Scalable to other LAs.



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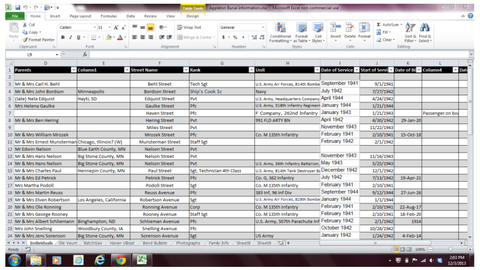
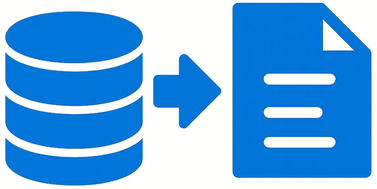
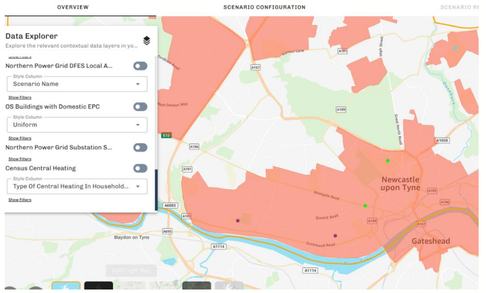
How did we set it up

Determine assets, interventions, other base data







Identify data | **Clean data** | **Ingest data** | **Refine data** | **Visualise data**

Automate and auto-refresh where possible

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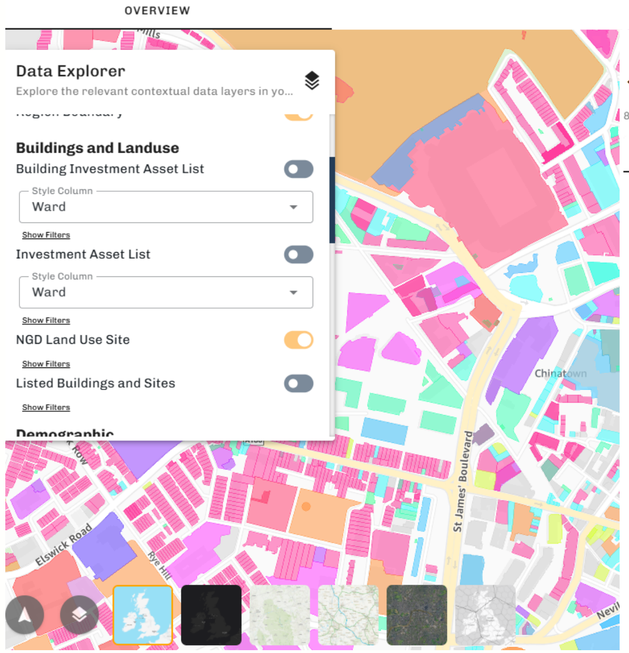
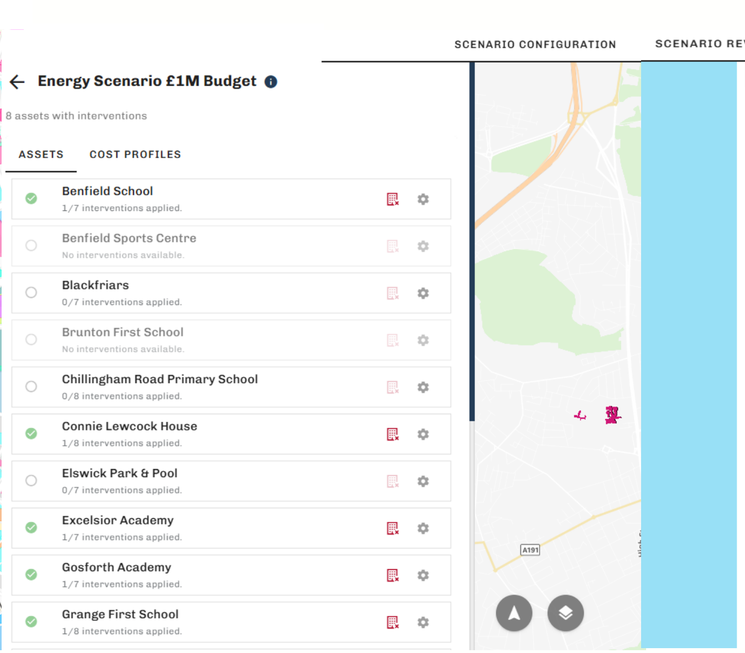
How does it work?

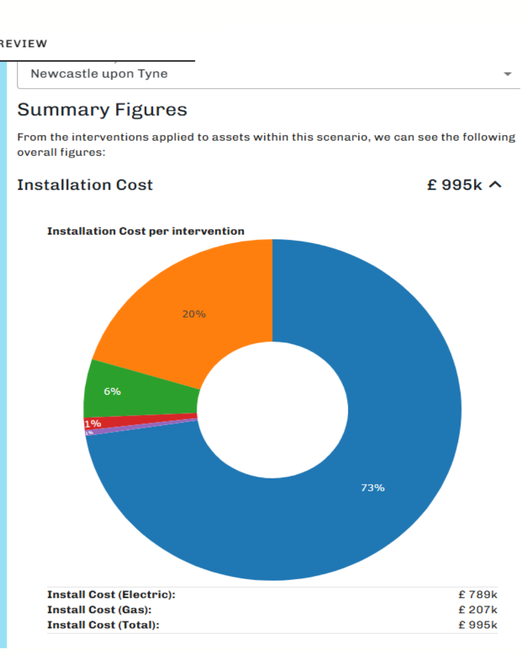
City overview



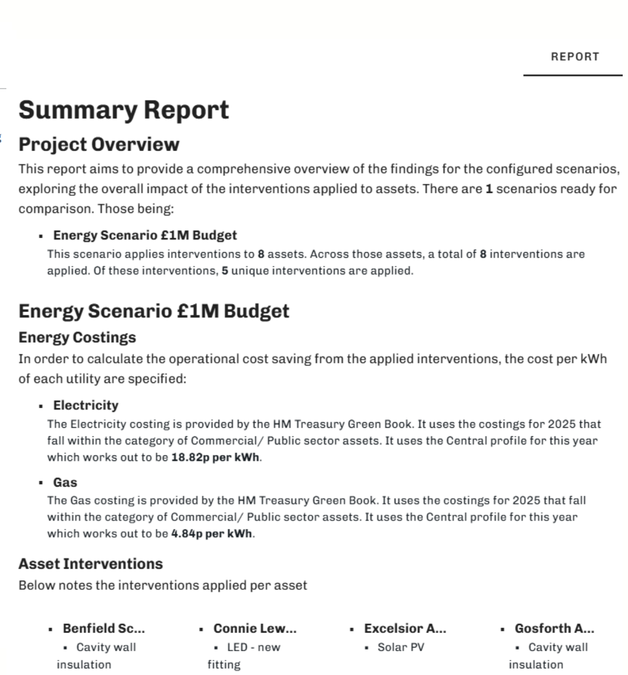
Scenario configurator



Scenario review



Report

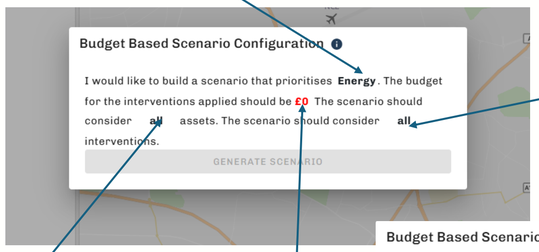


An example

You've £1.5million of funding (grant, borrowed etc.) to spend on solar PV in schools.

Scenario configurator

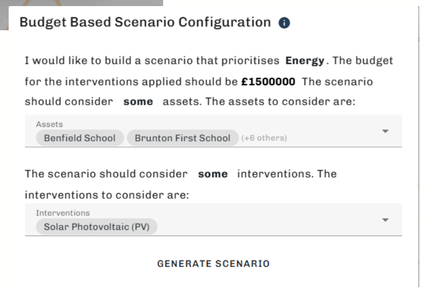
State whether you want to prioritise energy, carbon or installation cost



Determine the interventions

Determine your assets

State the budget

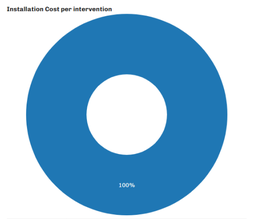


Scenario review

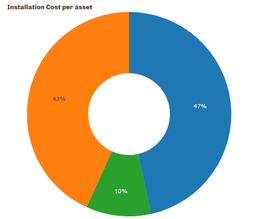
Summary Figures

From the interventions applied to assets within this scenario, we can see the following overall figures:

Installation Cost £ 1.45M



Install Cost (Electric): £ 1.45M
Install Cost (Total): £ 1.45M



Install Cost (Electric): £ 1.45M
Install Cost (Total): £ 1.45M

Cost Saving £ 141k

Energy Saving 749 MWh

Carbon Saving 1.2k LtCO2e

Report

Summary Report

Project Overview

This report aims to provide a comprehensive overview of the findings for the configured scenarios, exploring the overall impact of the interventions applied to assets. There are **1** scenarios ready for comparison. Those being:

- **Energy Scenario £1.5M Budget**
  This scenario applies interventions to **3** assets. Across those assets, a total of **3** interventions are applied. Of these interventions, **1** unique interventions are applied.

Energy Scenario £1.5M Budget

Energy Costings

In order to calculate the operational cost saving from the applied interventions, the cost per kWh of each utility are specified:

- **Electricity**
  The Electricity costing is provided by the HM Treasury Green Book. It uses the costings for 2025 that fall within the category of Commercial/ Public sector assets. It uses the Central profile for this year which works out to be **18.82p per kWh**.
- **Gas**
  The Gas costing is provided by the HM Treasury Green Book. It uses the costings for 2025 that fall within the category of Commercial/ Public sector assets. It uses the Central profile for this year which works out to be **4.84p per kWh**.

Asset Interventions

Below notes the interventions applied per asset

- **Chillingham Road Primary School**
  - Solar PV
- **Excelsior Academy**
  - Solar PV
- **Gosforth Academy**
  - Solar PV

Key Figures

Assets Impacted	Total Interventions Applied	Unique Interventions Applied
3	3	1

Total Installation Cost
£1.45M

Annual Cost Saving	Annual Energy Saving	Lifetime Carbon Saving
£141k	749 MWh	1.2k LtCO2e

Annual Cost Saving per £ spent	Annual Energy Saving per £ spent	Lifetime Carbon Saving per £ spent
0.097 £/£ spent	0.52 kWh/£ spent	0.00083 LtCO2e/£ spent

Regional Carbon Impact	Council Assets Carbon Impact
0.000045 % reduction in carbon	0.0014 % reduction in carbon

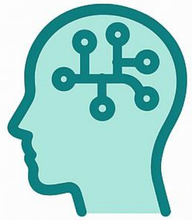
What are its strengths

Layering of different data sources to understand interactions between data sets

Mix and match different interventions and then model the impact of these

Calculated cost of interventions vs potential energy and carbon savings

Enables high level business case development based on analysis provided by the tool



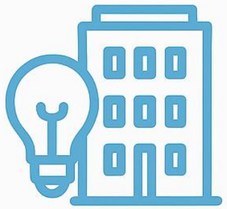
Use of AI in interrogating the data as well as running scenarios

Visualisations to aid understanding

Production of easy to review reports

Scalable to other local authorities

What could it do better



Develop and apply interventions for buildings without pre-defined data

Factor in cost to borrow when financing interventions

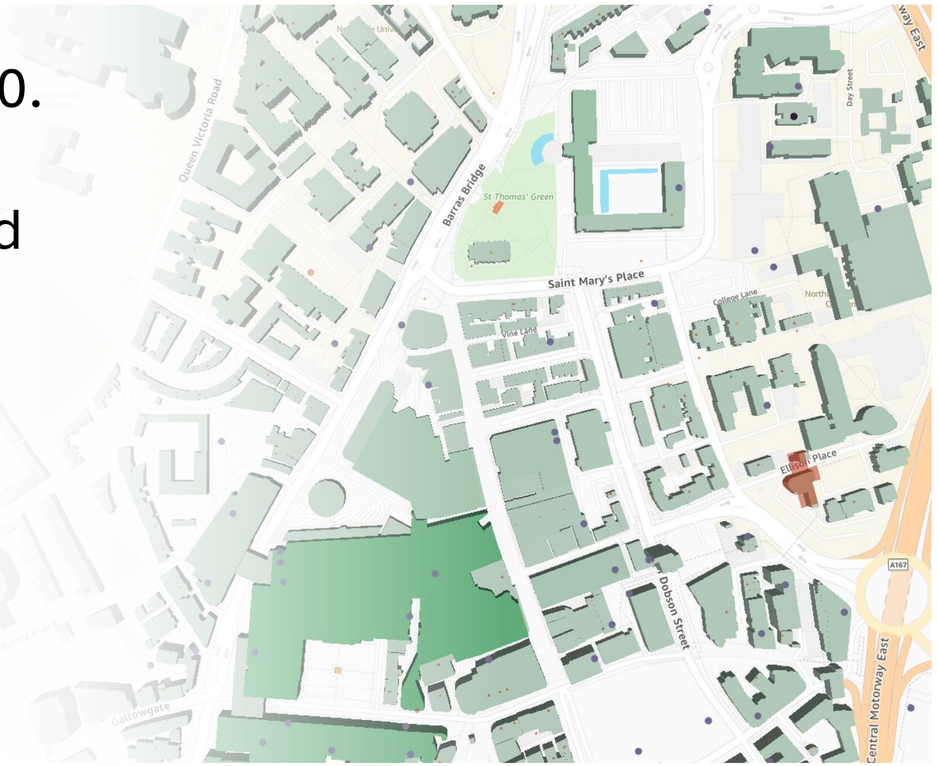
Bringing our internal teams on the journey with us

Future development plans

- Secure additional funding
- Scale up solution to include all Newcastle buildings
- Expand to cover whole of North East
- Develop AI capabilities
- Enhance ability of tool to feed directly into business cases
- Expand interventions
- Explore including other decarbonisation thematic areas (e.g. Transport)

Summary

- The city recognises that there are a number of challenges and that more needs to be done to achieve Net Zero by 2030.
- The Net Zero interventions spatial planning tool models different Net Zero interventions in the built environment and involves taking buildings and other stationary assets and then combining with different data sources.
- The tool has been demonstrated to add value in accessing the viability of certain interventions.
- The future of the tool is expanding it to include more buildings, more interventions and over a greater area.
- We'll look to develop the tool further in 2026.



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Thank you!

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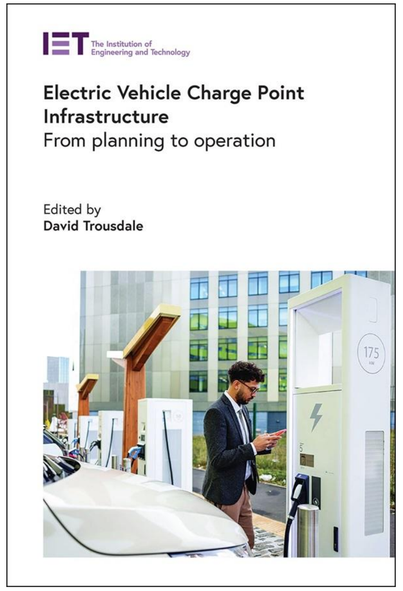

I've also released a book!

Available in print or ebook: theiet.org/books