NATIONAL DIGITAL TWIN PROGRAMME

The information infrastructure that will unleash the information economy

UNIVERSITY OF CAMBRIDGE

UKRI UK Research and Innovation

Department for Business, Energy & Industrial Strategy

cdbb Centre for Digital Built Britain
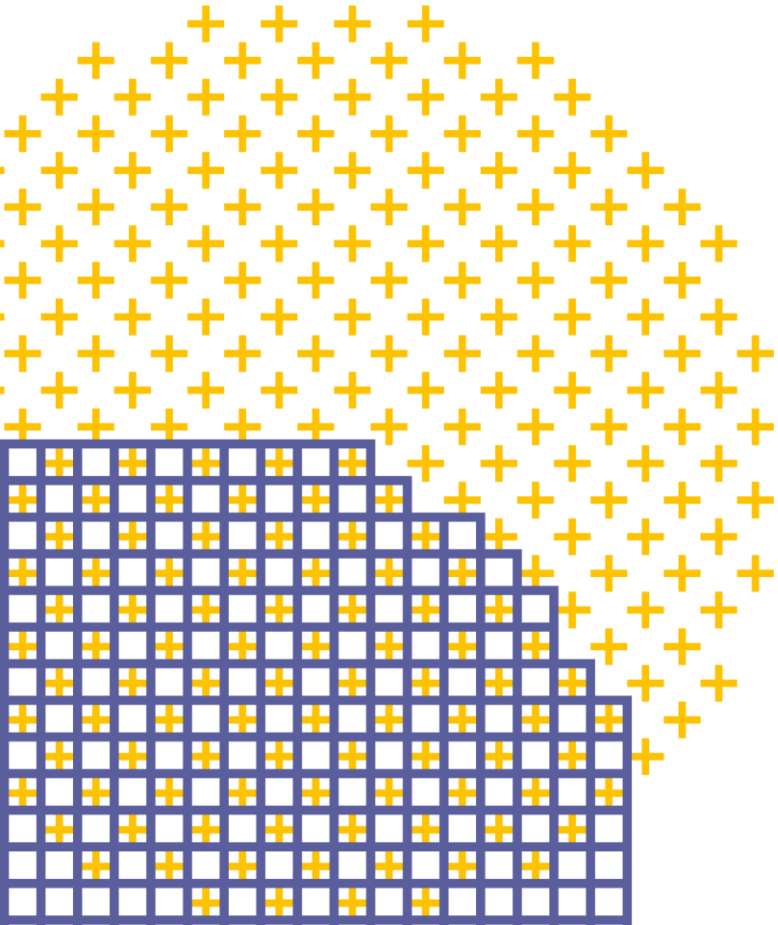
Data for the public good

Recommendations

1. **A National Digital Twin** – an ecosystem of connected digital twins to enable better outcomes from our built environment

2. **An Information Management Framework** – to enable secure resilient data sharing and effective information management

Data for the public good

NATIONAL INFRASTRUCTURE COMMISSION

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System of systems = cities/places
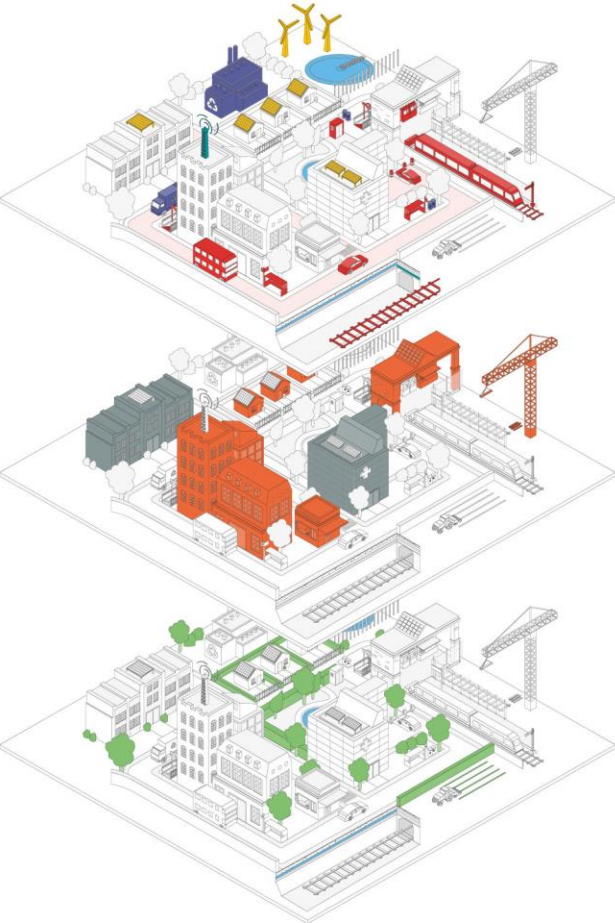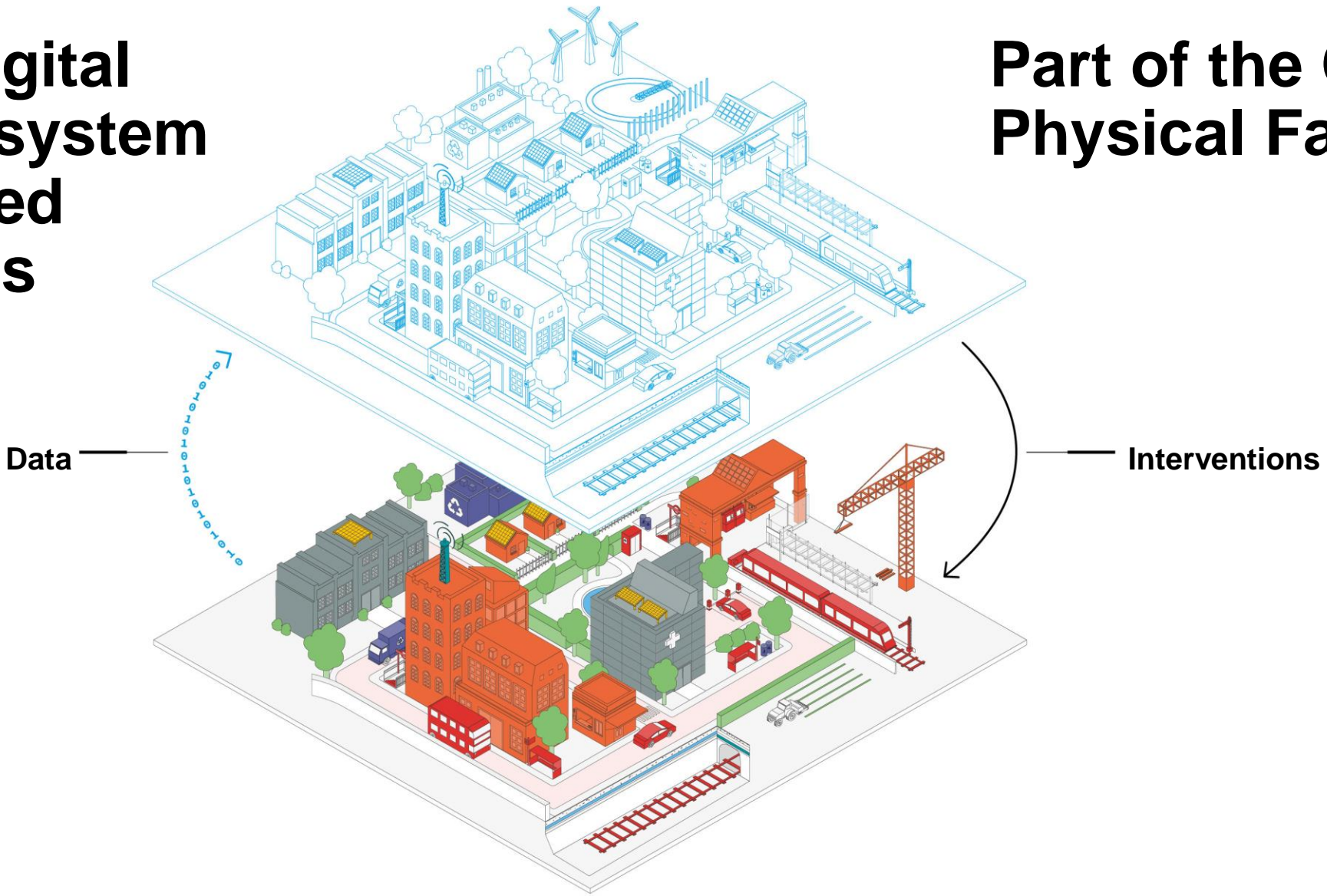

Economic
Infrastructure

Social
Infrastructure

Natural
Infrastructure

Built Environment

National Digital Twin = ecosystem of connected digital twins

Part of the Cyber-Physical Fabric

Data

Interventions

Flourishing systems

A vision for infrastructure that is:

People-focused – recognising the fundamental role of infrastructure and technology in the social, economic and environmental outcomes that determine the quality of people's lives.
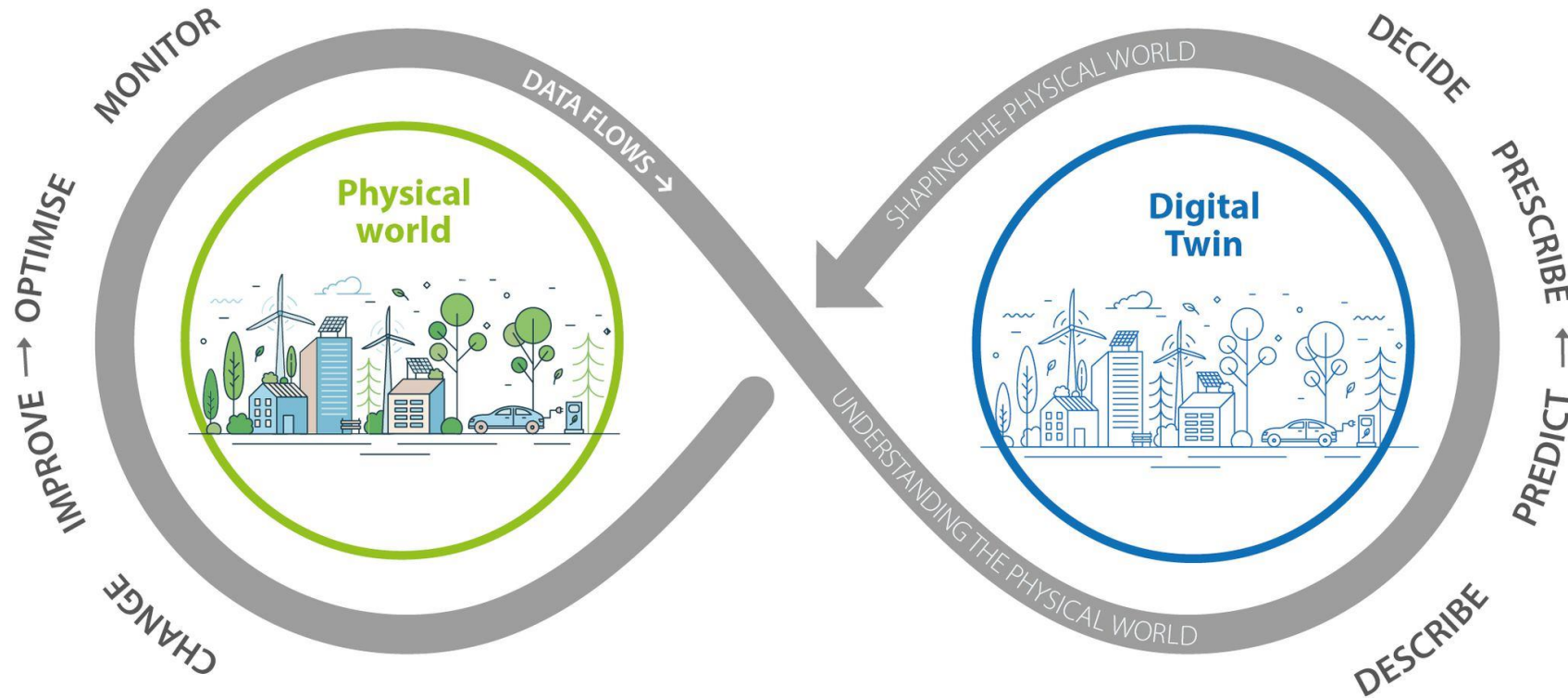
Systems-based – recognising infrastructure as a complex, interconnected system of systems that must deliver continuous service to society.
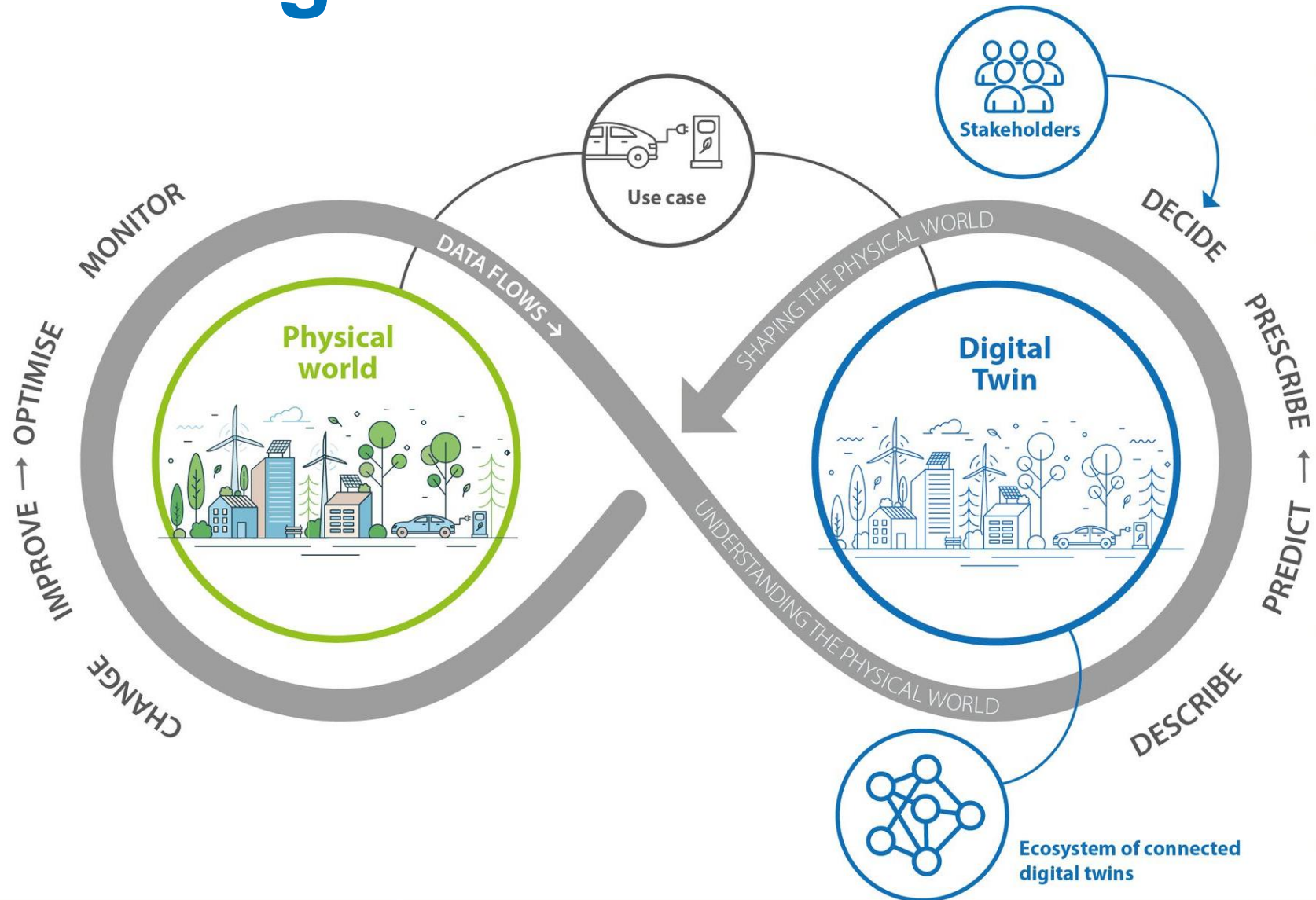
What is a digital twin?

What is a digital twin?

The pathway towards an Information Management Framework

1. **Foundation Data Model** – a consistent, clear understanding of what constitutes the world of digital twins

2. **Reference Data Library** – the particular set of classes and the properties we will want to use to describe our digital twins

3. **Integration Architecture** – the protocols that will enable the managed sharing of data

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The pathway towards an Information Management Framework

A 'Commons' for Digital Built Britain

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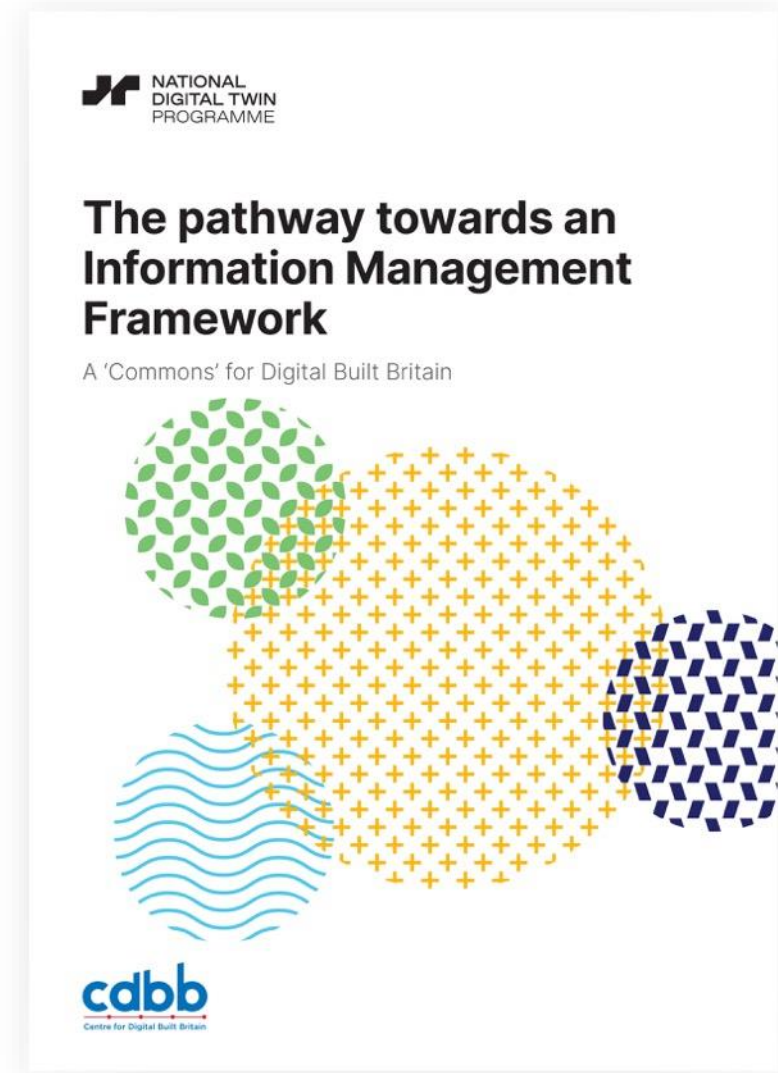
Guided by the Gemini Principles

Purpose:
Must have clear purpose

Trust:
Must be trustworthy

Function:
Must function effectively

Public good
Must be used to deliver genuine public benefit in perpetuity

Value creation
Must enable value creation and performance improvement

Insight
Must provide determinable insight into the built environment

Security
Must enable security and be secure itself

Openness
Must be as open as possible

Quality
Must be built on data of an appropriate quality

Federation
Must be based on a standard connected environment

Curation
Must have clear ownership, governance and regulation

Evolution
Must be able to adapt as technology and society evolve

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The Gemini Principles

Digital twins of physical assets are helping organisations to make better-informed decisions, leading to improved outcomes.
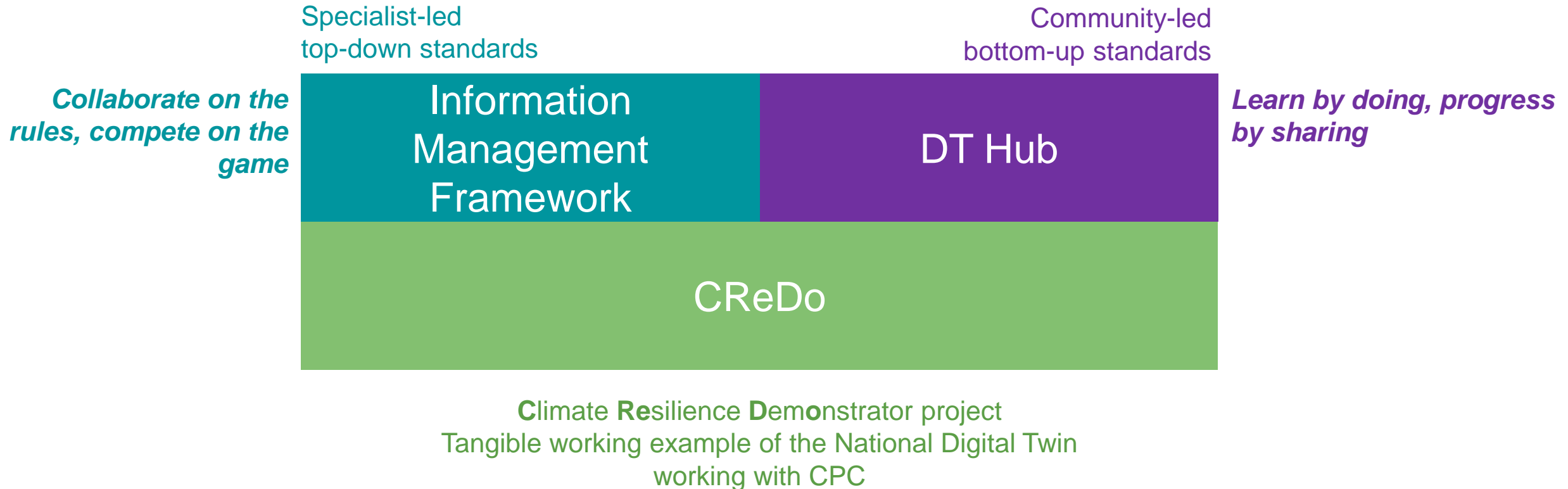
Creating an ecosystem of connected digital twins – a national digital twin – opens the opportunity to release even greater value, using data for the public good.

This paper sets out proposed principles to guide the national digital twin and the information management framework that will enable it.

DT purpose: The use case framework

City level digital twins
- Planning future investments
- Transport use scenarios

Strategy and planning

Optimisation – future
- Predictive maintenance

Operations – current
- Control of autonomous systems

Managing assets

Assurance

Safety and resilience
- Certification
- Fire safety
- Calculating resilience levels

Context – National Digital Twin key projects for FY21/22

Specialist-led
top-down standards

Community-led
bottom-up standards

Collaborate on the rules, compete on the game

Learn by doing, progress by sharing

Information Management Framework

DT Hub

CReDo

Climate **Re**silience **Dem**onstrator project
Tangible working example of the National Digital Twin working with CPC

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CReDo purpose

1. Climate change

- Climate change is a systemic challenge that demands systems-based solutions. Cross-sector data sharing is an essential enabler of net-zero and climate resilience.

- To demonstrate meaningful secure, resilient information sharing across organisational and sectoral boundaries in the 'domain' of Climate Resilience for the water, energy and telecoms sectors.

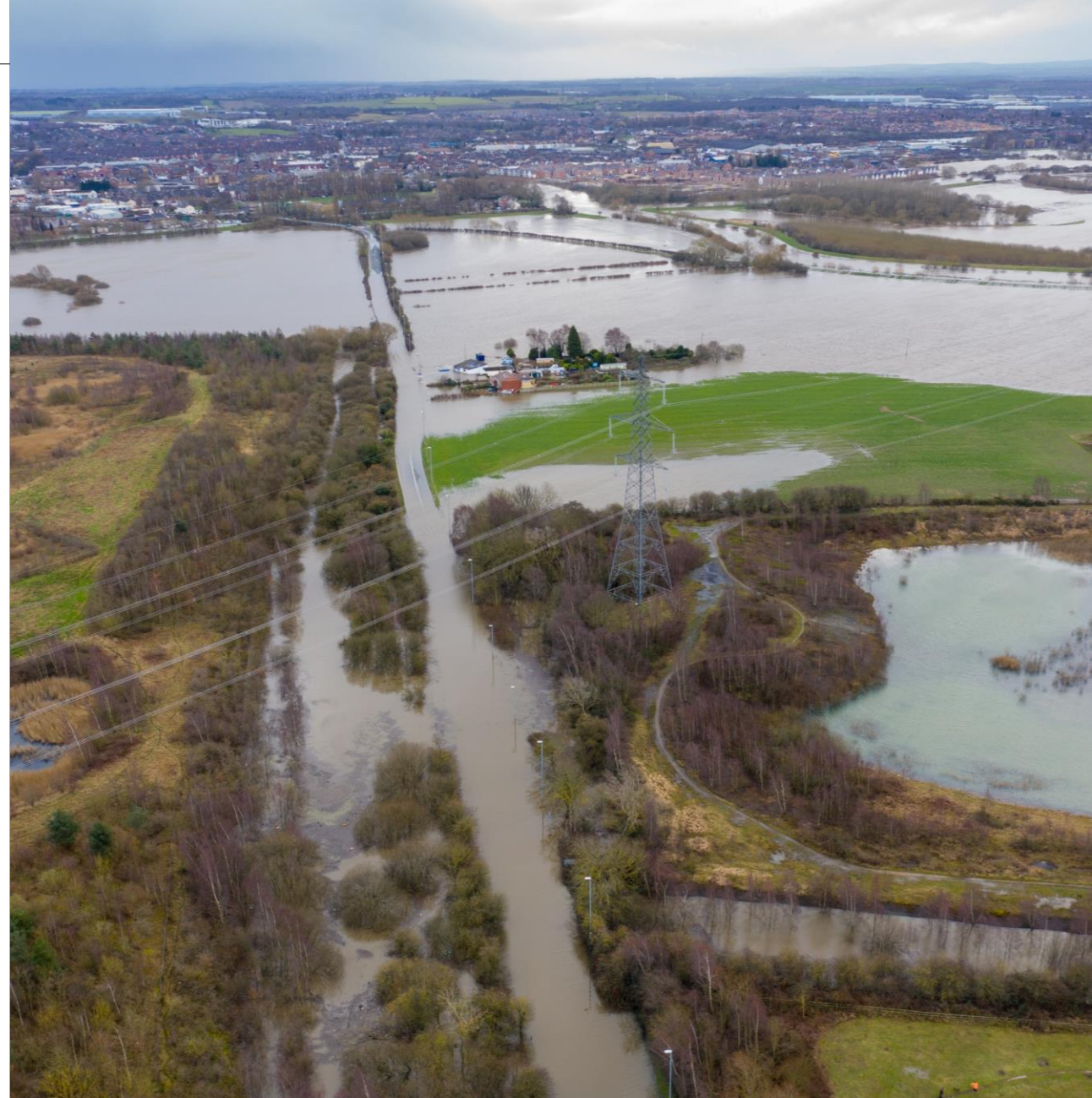- DT's as an essential enabler of net zero

2. Information Management Framework (IMF)

- To develop a tangible working example of the National Digital Twin - a 'thin slice' of the envisaged ecosystem of connected digital twins.

- Apply Information Management Framework approach to achieve cross-sector interoperability.

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CReDo: Climate Resilience Demonstrator project

- Climate change adaptation digital twin
- The initial use case will be impact of flooding on the networks and the system interdependencies.
- CreDo will connect data across water, energy and telecoms assets in a selected region in UK
- CReDo will inform decisions in operations and capital planning, and real-time response to extreme weather events caused by climate change.
- Successful outcome is scalable and replicable (using IMF approach)

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Build better connections:
digitaltwinhub.co.uk

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