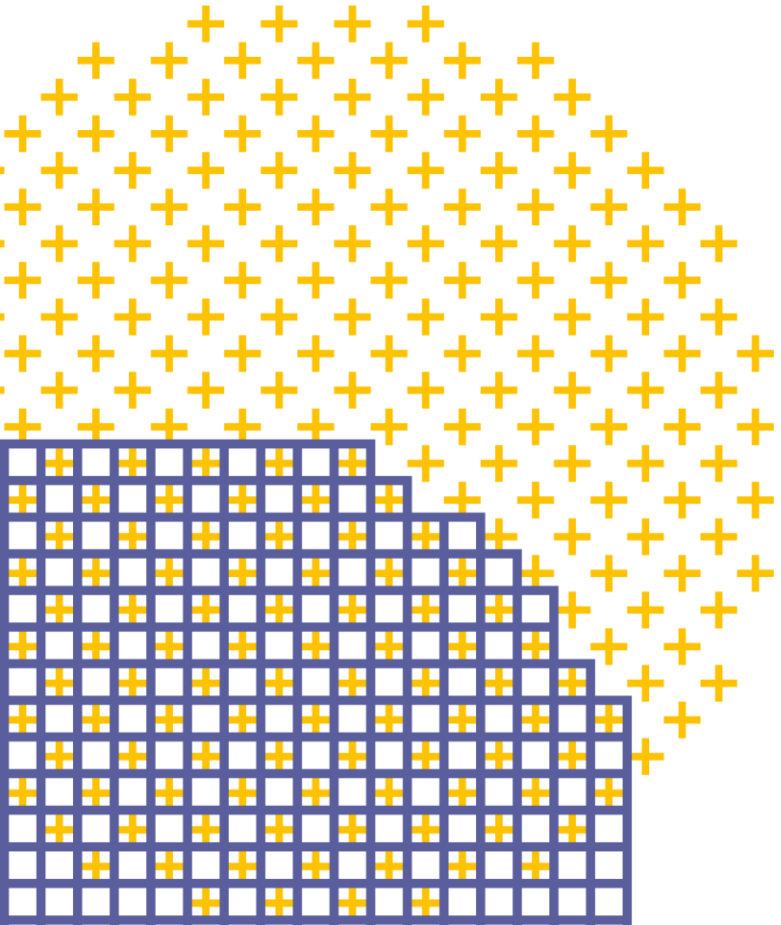


NATIONAL DIGITAL TWIN PROGRAMME

Data infrastructure
to create the future we want
Or
How can we be better ancestors?

UNIVERSITY OF CAMBRIDGE

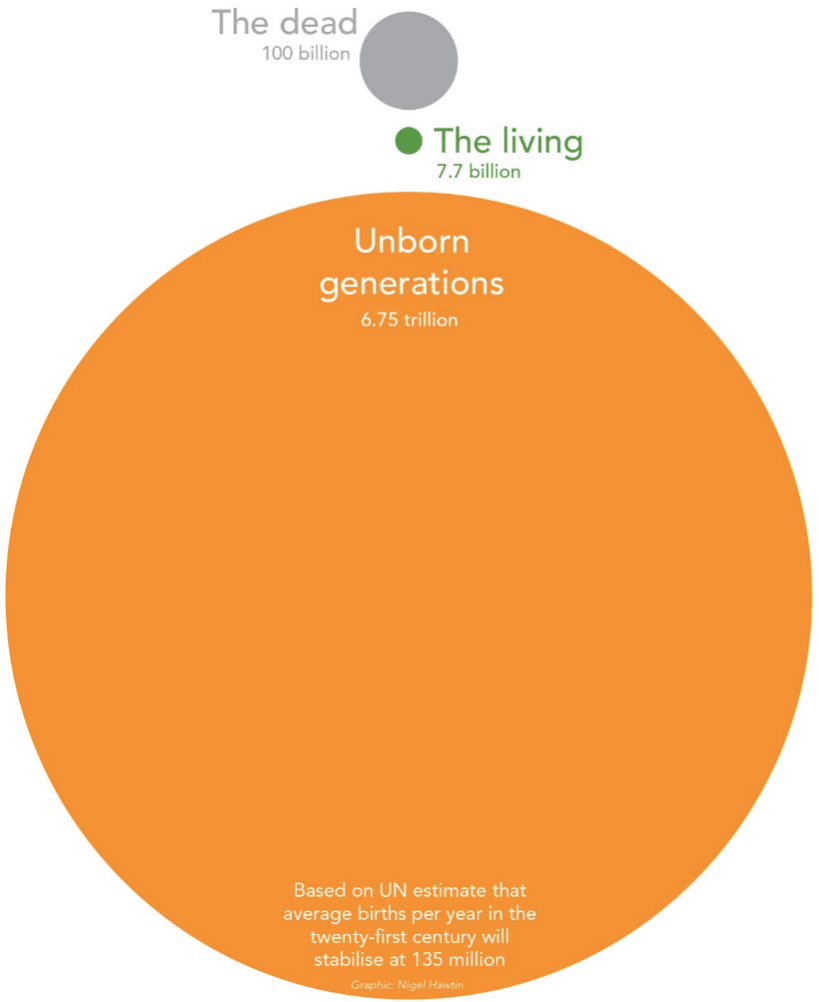
UK Research and Innovation

Department for Business, Energy & Industrial Strategy

cdbb
Centre for Digital Built Britain

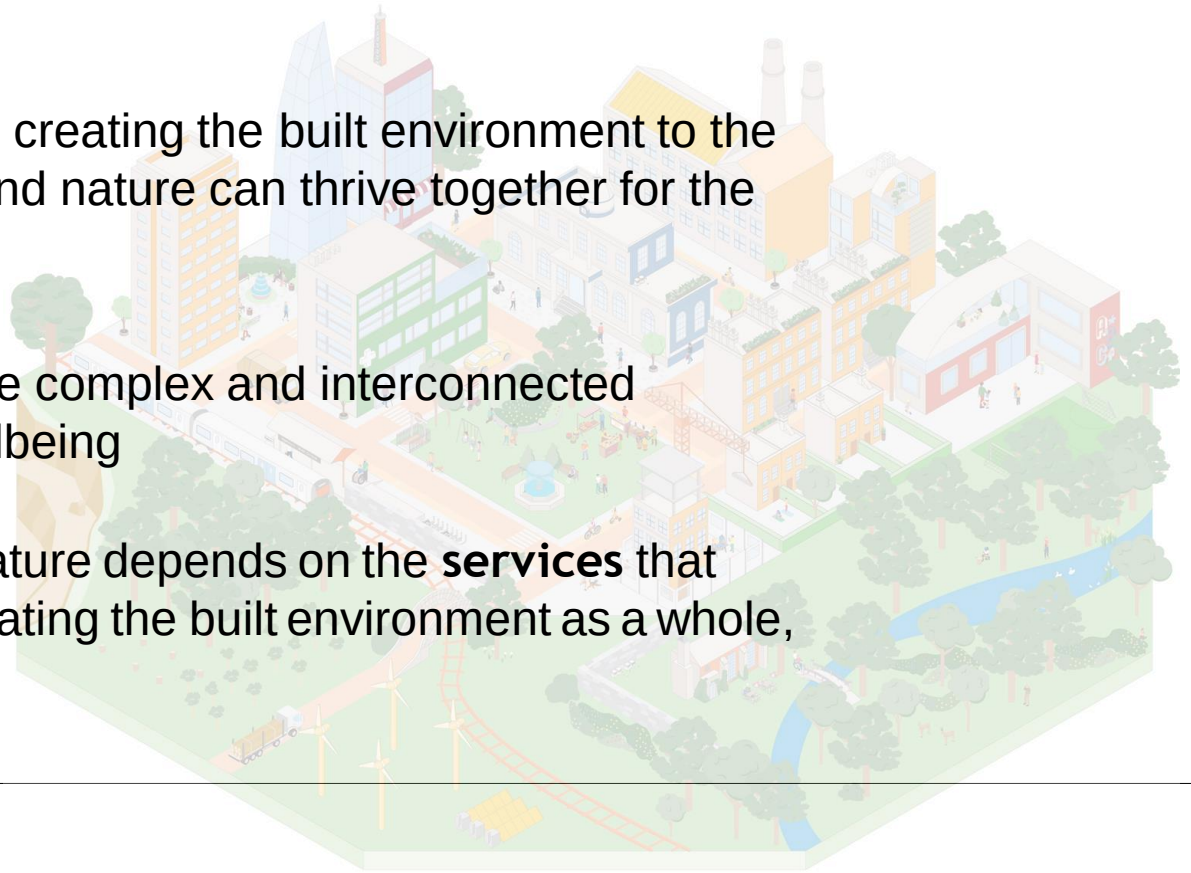
The scale of unborn generations

Looking 50,000 years into the past and 50,000 into the future – assuming that the twenty-first century's birth rate remains constant – all human lives ever lived are far outweighed by all those yet to come



The Vision

Our Vision is for a built environment whose explicit purpose is to enable people and nature to flourish together for generations



It is only when we shift our focus from creating the built environment to the **outcomes** enabled by it that people and nature can thrive together for the generations to come

The built and natural environments are complex and interconnected **systems** that are essential for our wellbeing

Improving outcomes for people and nature depends on the **services** that these systems provide and on coordinating the built environment as a whole, not just as individual parts

Why now

The built environment is too big to ignore

The greatest challenges of our generation are systemic and interdependent

The pandemic has emphasised important realities:

- Wellbeing is crucial
- Decisions have long-term consequences
- Change can happen quickly
- We need to get more from less

Why now - Choices in the built environment can last for generations

Millennia

Infrastructure corridors can last for millennia, like the routes of Roman roads that we still use today.

Centuries

Civil structures can remain serviceable for centuries, like Victorian bridges and tunnels, or post-war tower blocks.

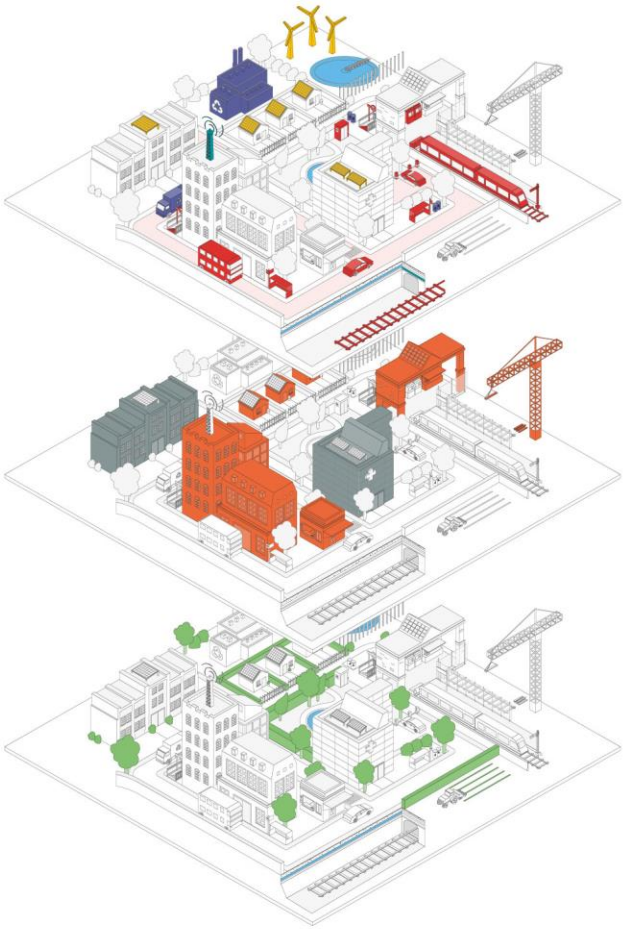
Decades

Mechanical components require repair or replacement within decades, like lifts and pumping stations.

Years

Software developments can be annual or even more frequent.

The built environment as a system of systems



Economic Infrastructure

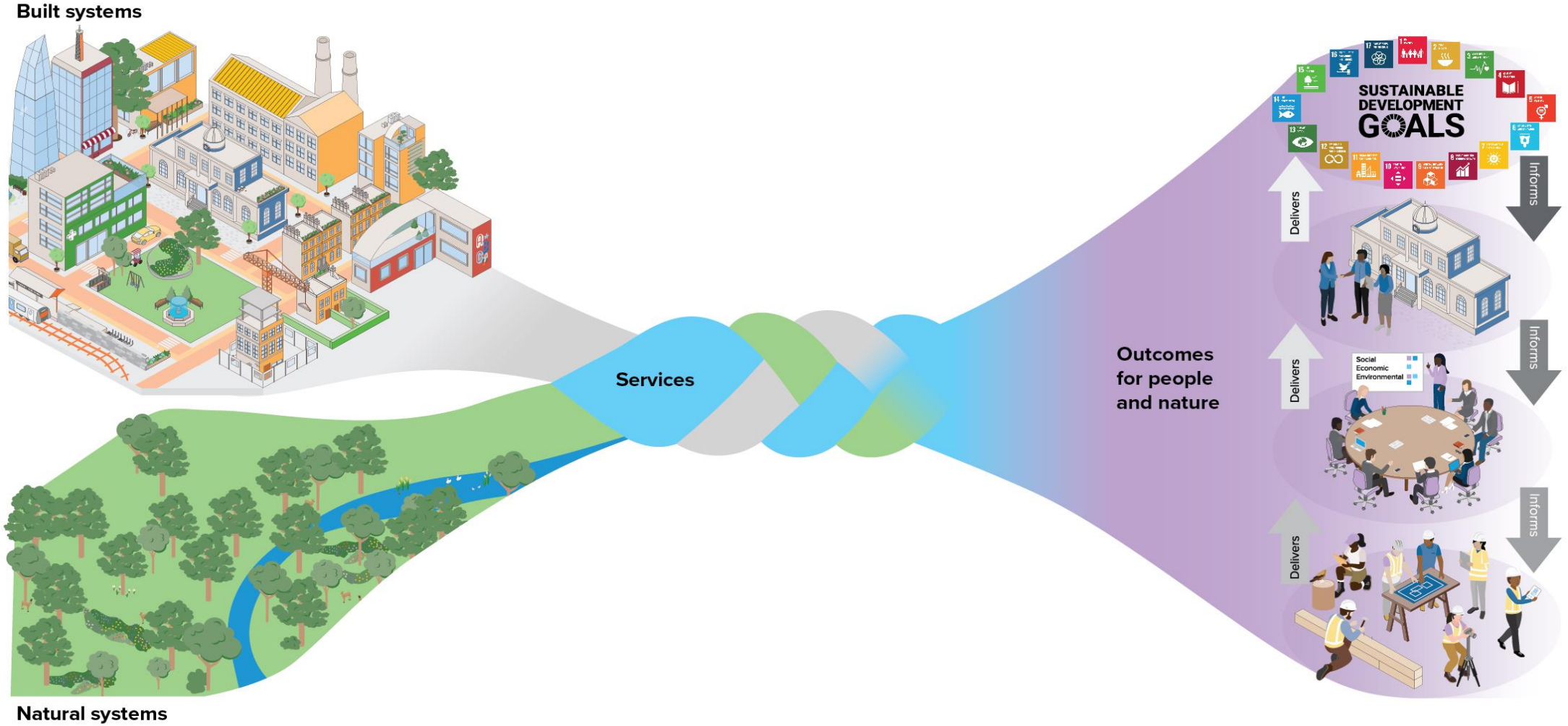
Social Infrastructure

Natural Infrastructure

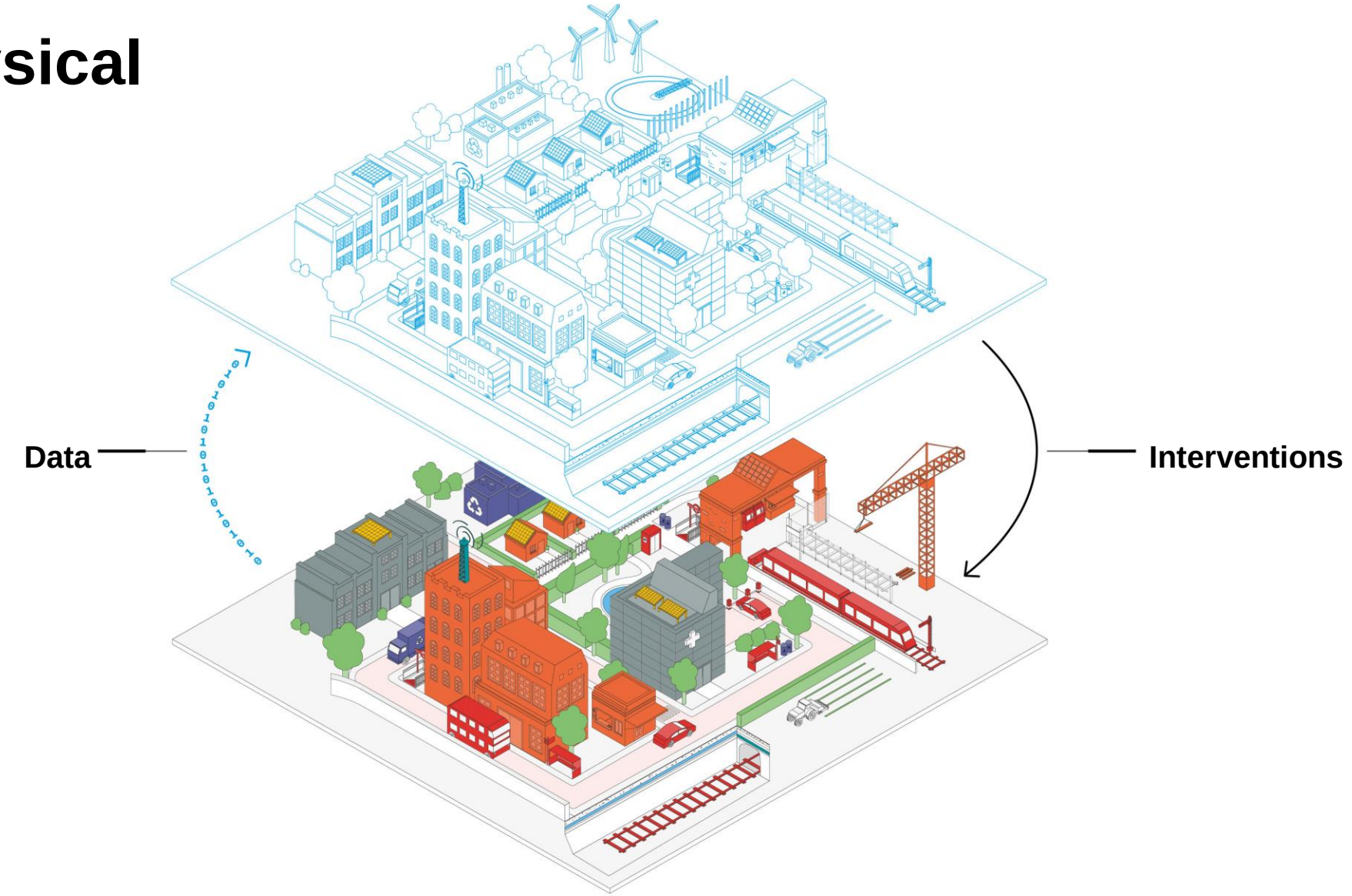
Built Environment

NATIONAL DIGITAL TWIN PROGRAMME

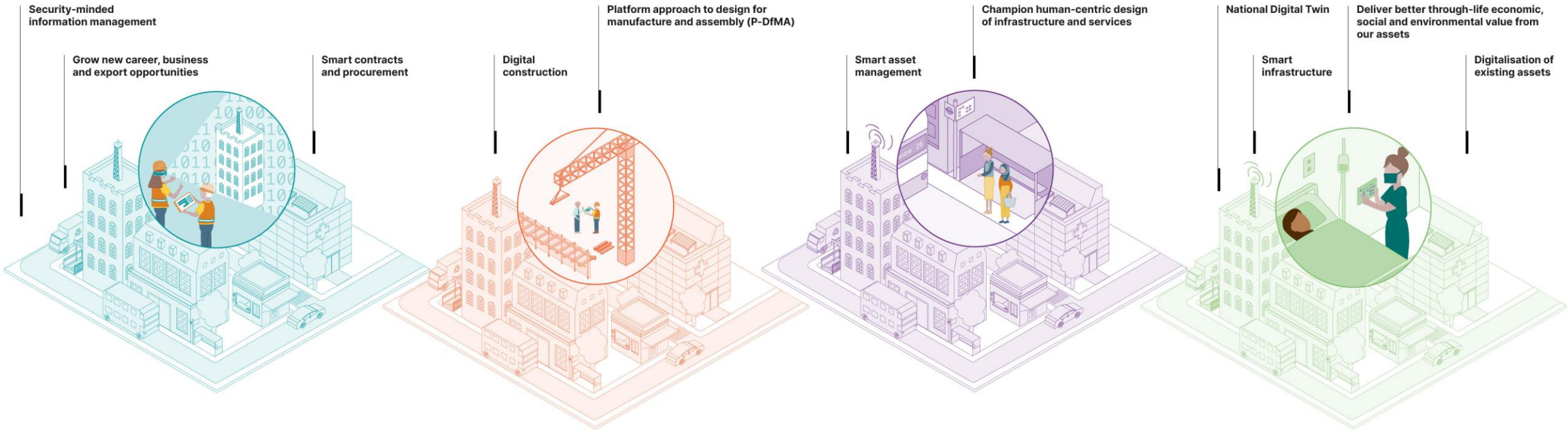
Services - the connection between the outcomes we desire and the systems we use to achieve them



Cyber-physical system



This is digital built Britain



Design

Use best practice, secure by default, information management and digital techniques to get data right from the start and design better-performing homes, buildings and infrastructure.

Build

Exploit new and emerging digital construction, information management, and manufacturing technologies to improve safety, quality and production during construction.

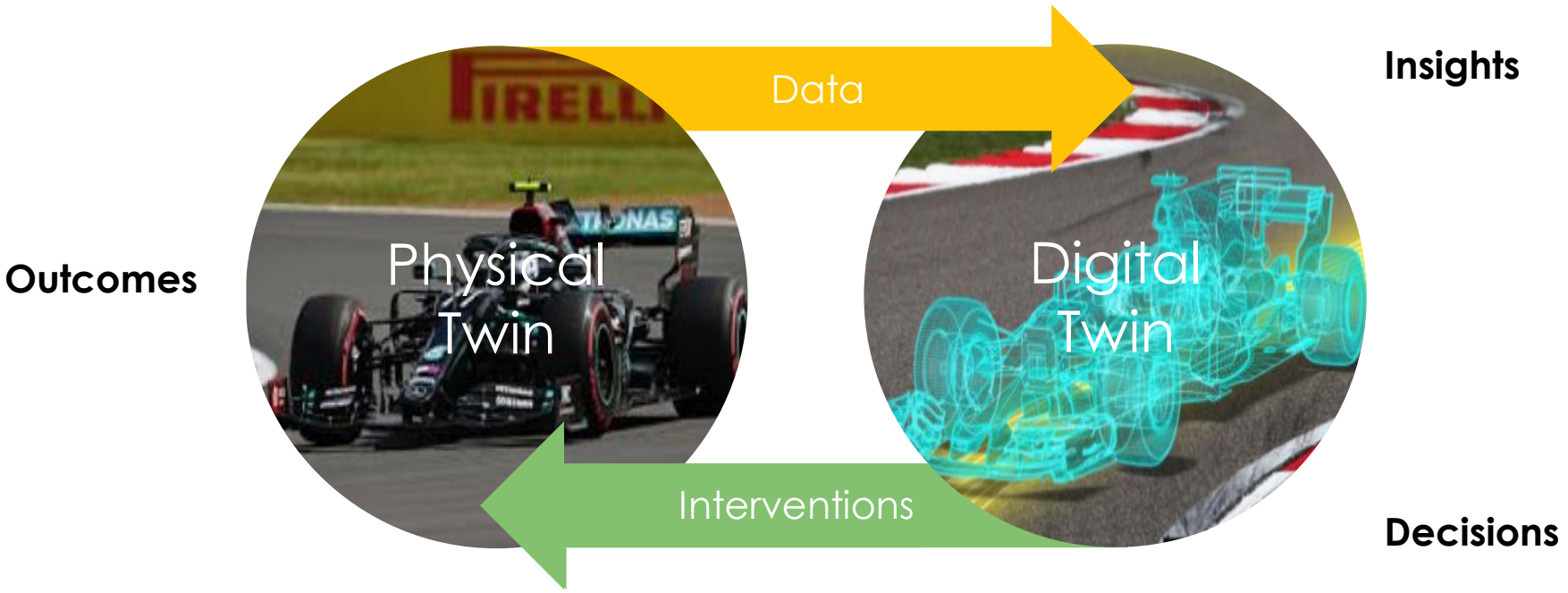
Operate

Use effective information management to transform the performance of the built environment and the services it delivers.

Integrate

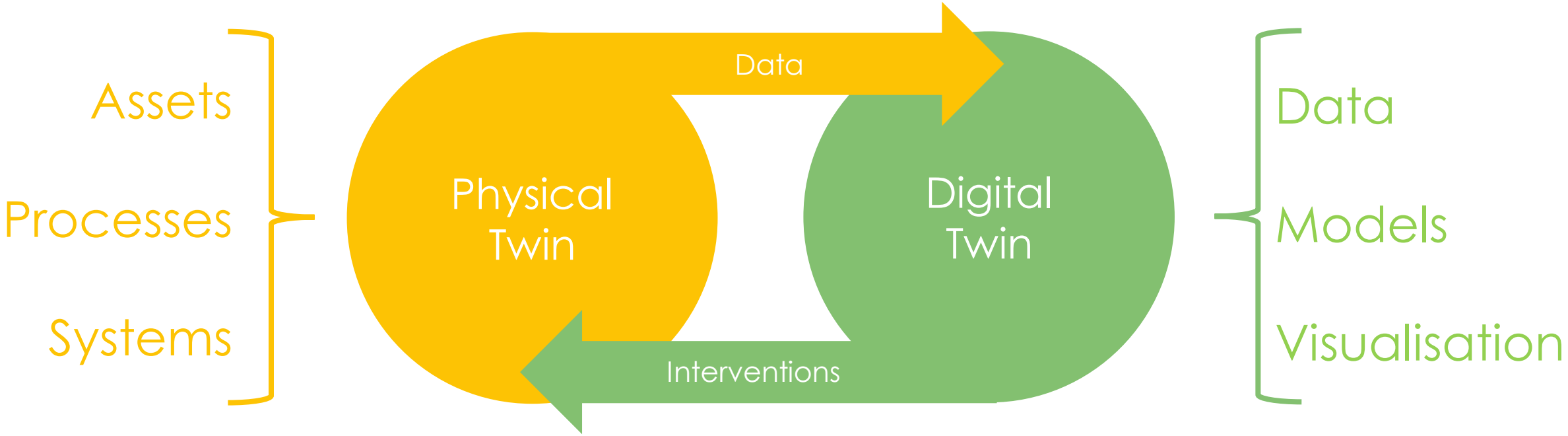
Understand how the built environment can improve citizen's quality of life and use that information to drive the design and build of our economic and social infrastructure and the operation an integration of the services they deliver.

Digital twins



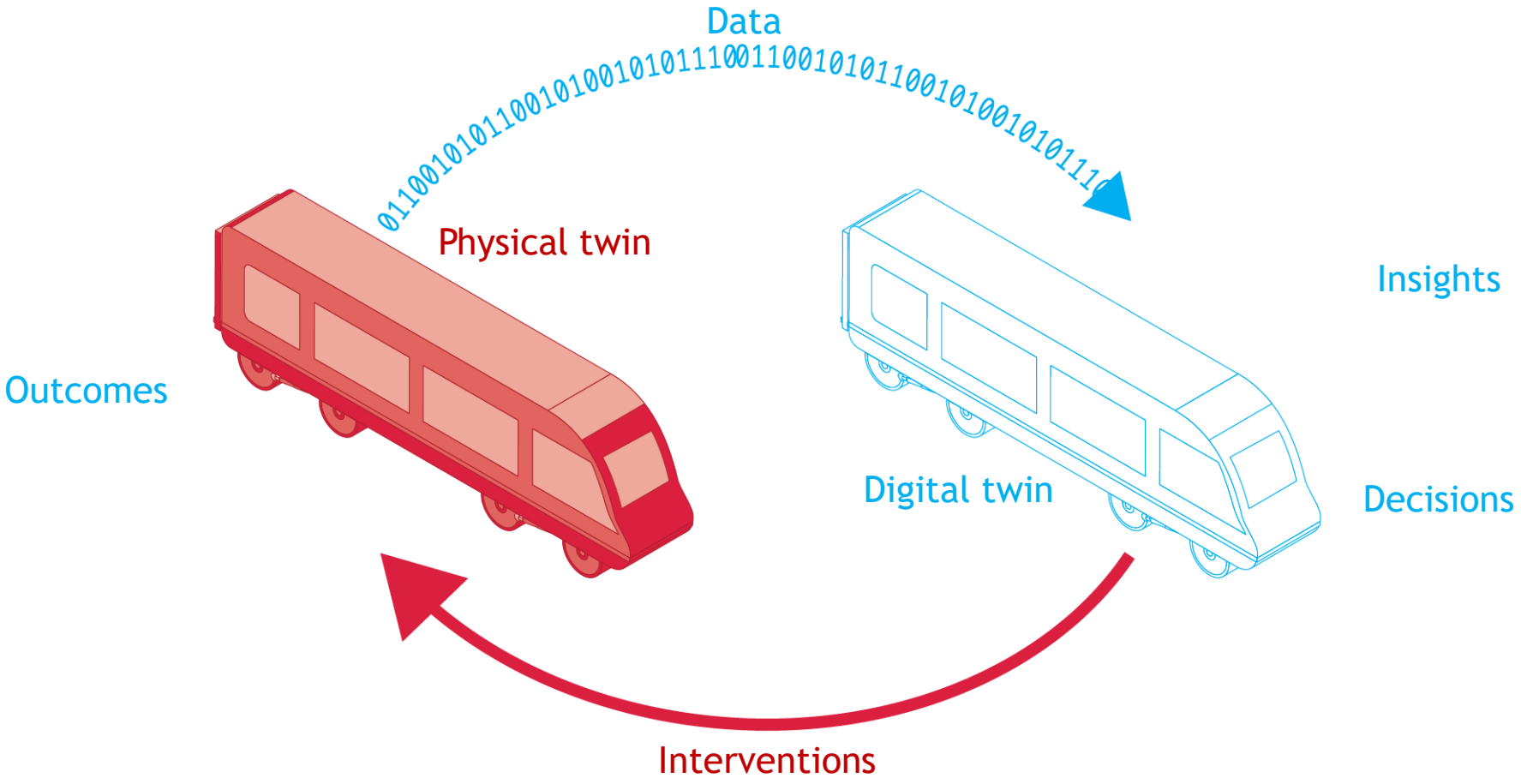
Digital twins

Delivering value: “better decisions faster”



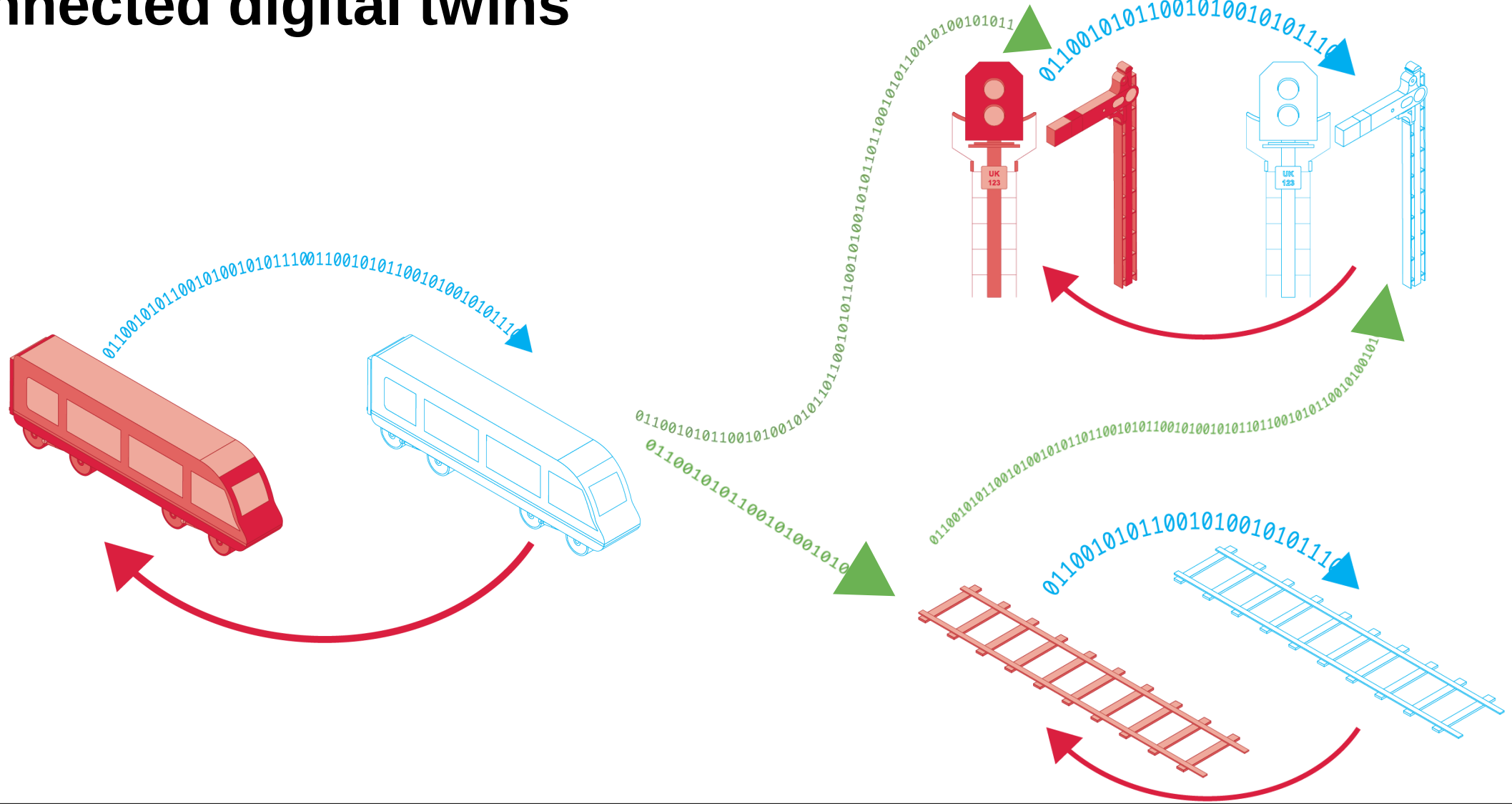
Driven by values: purpose, trust and function

Digital twins



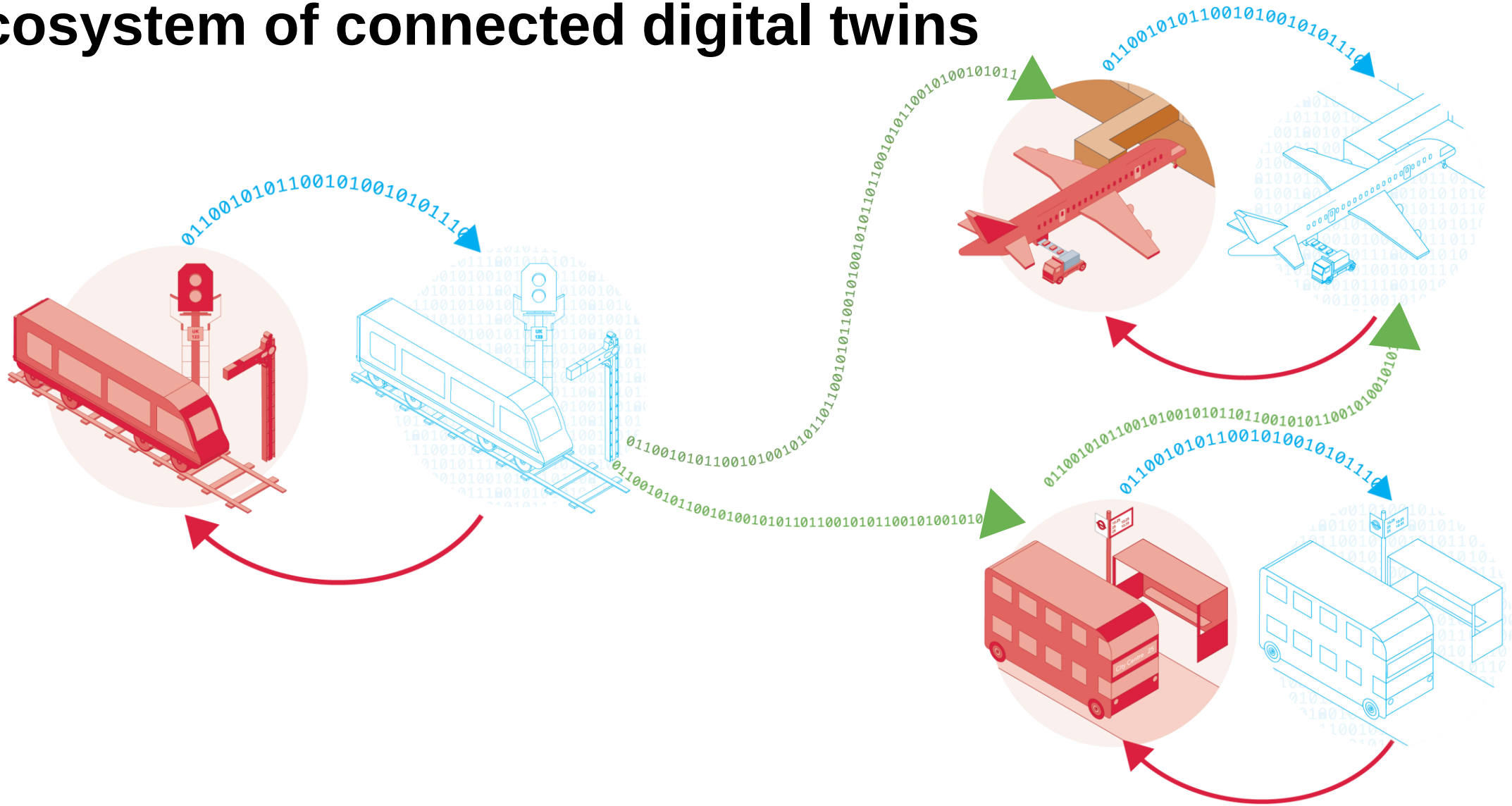
NATIONAL DIGITAL TWIN PROGRAMME

Connected digital twins



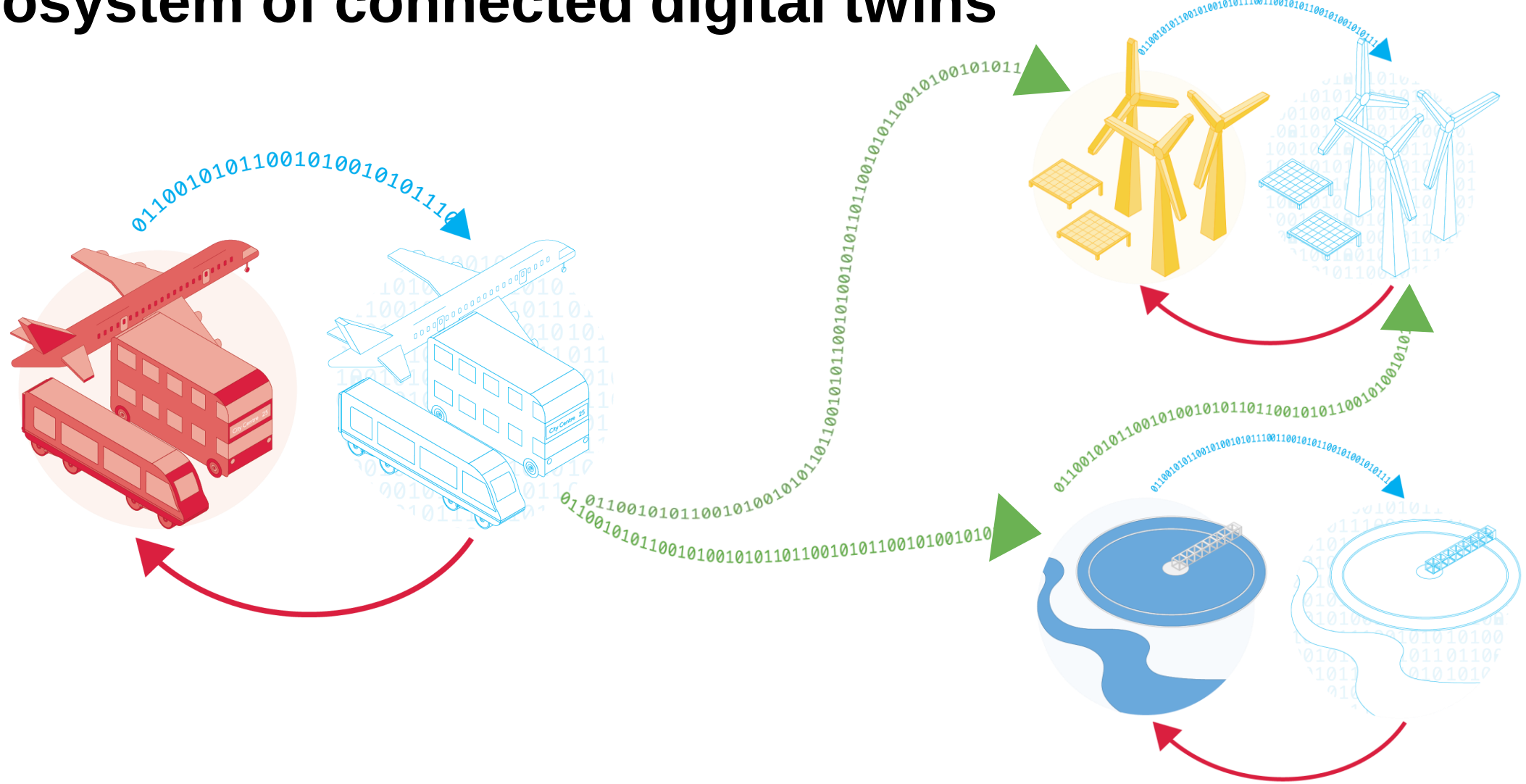
NATIONAL DIGITAL TWIN PROGRAMME

Ecosystem of connected digital twins



NATIONAL DIGITAL TWIN PROGRAMME

Ecosystem of connected digital twins



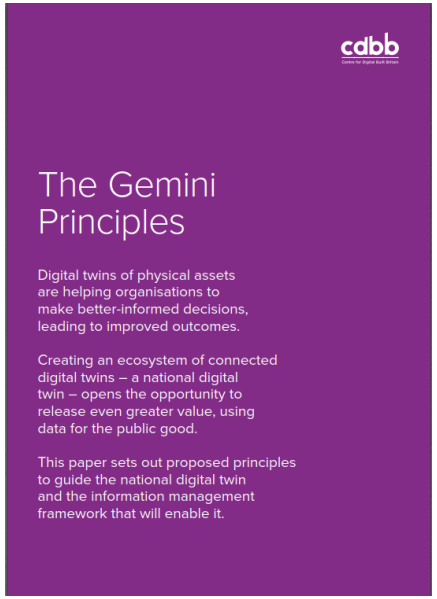
The pathway towards an Information Management Framework

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

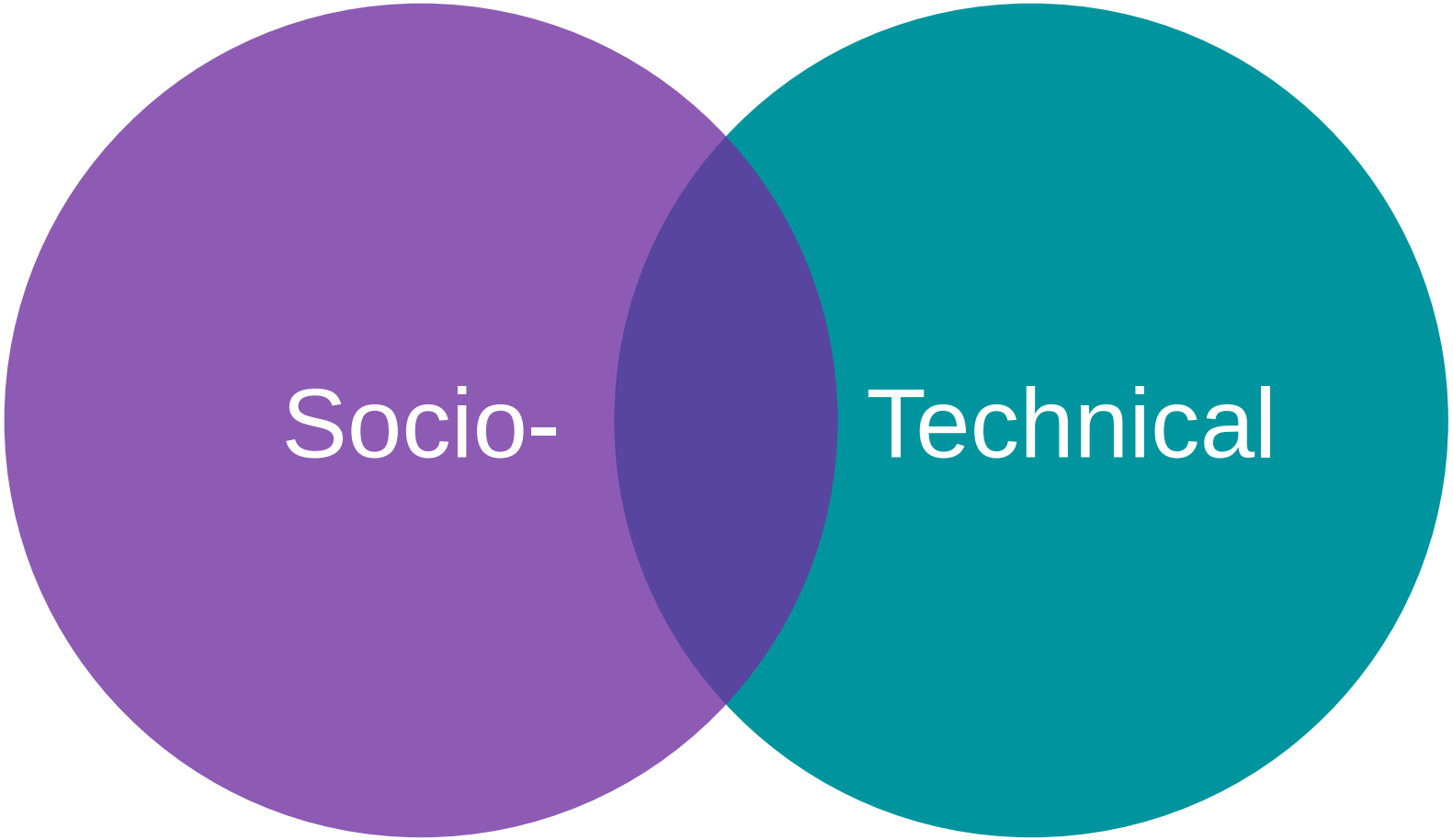
3. **Integration Architecture** – the protocols that will enable the managed sharing of data

Driven by values



Purpose: Must have clear purpose	**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
Trust: Must be trustworthy	**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
Function: Must function effectively	**Federation** Must be based on a standard connective environment	**Curation** Must have clear ownership, governance and regulation	**Evolution** Must be able to adapt as technology and society evolve

A NDTp has to be a socio-technical change programme



Benefits of a National Digital Twin

Better decisions equal better outcomes for people and society

1. **Benefits to society**: Improved stakeholder engagement. Better outcomes for the ultimate customers (the public – taxpayers/bill payers/fare payers/voters). Improved customer satisfaction and experience through higher-performing infrastructure and the services it provides.

2. **Benefits to the economy**: Improved national productivity from higher-performing and resilient infrastructure operating as a system. Improved measurement of outcomes. Better outcomes per whole-life pound. Improved information security and thereby personnel, physical and cyber security.

3. **Benefits to business**: New markets, new services, new business models, new entrants. Improved business efficiency from higher-performing infrastructure. Improved delivery efficiency, benefiting the whole construction value chain – investors, owners, asset managers, contractors, consultants, suppliers. Reduced uncertainty and better risk management.

4. **Benefits to the environment**: Less disruption and waste. More reuse and greater resource efficiency – a key enabler of net zero and the circular economy in the built environment.

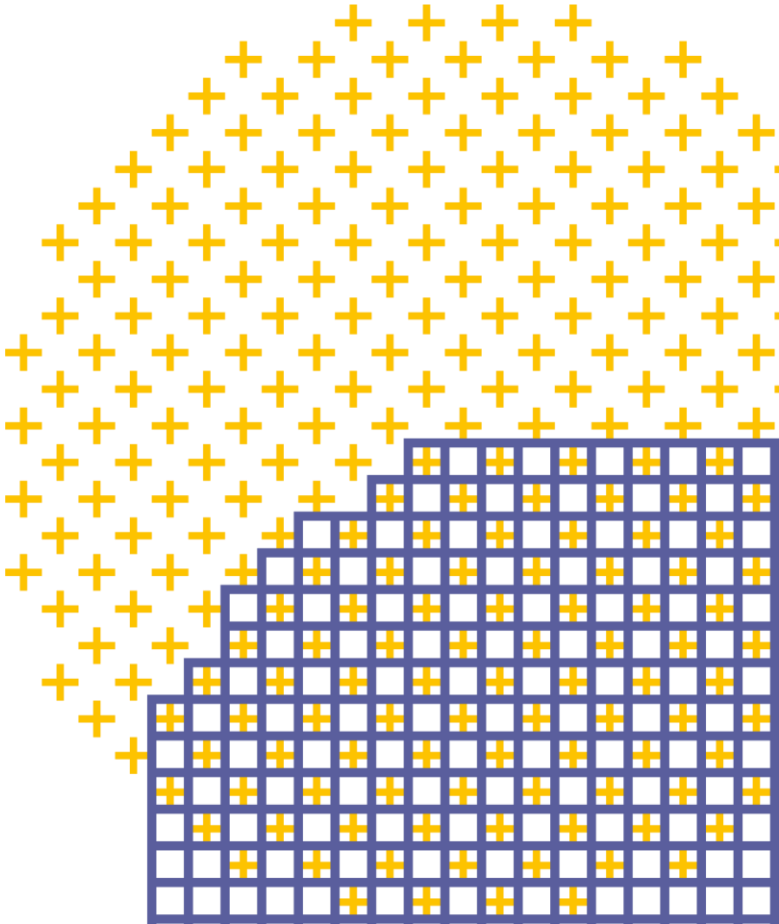
The planet is ultimate system of systems

We can make Our Vision a reality, but only if we all play our part with energy, coordination and purpose, making use of the advanced array of enablers that we now have at our disposal.

NATIONAL DIGITAL TWIN PROGRAMME

Thank you

Build better connections:
digitaltwinhub.co.uk



UNIVERSITY OF CAMBRIDGE

UK Research and Innovation

Department for Business, Energy & Industrial Strategy

cdbb
Centre for Digital Built Britain