Lincolnshire Coast 2100+

Coastal Investment Plan

Strategic design brief

17th February 2025

Environment Agency

ARUP

one architecture
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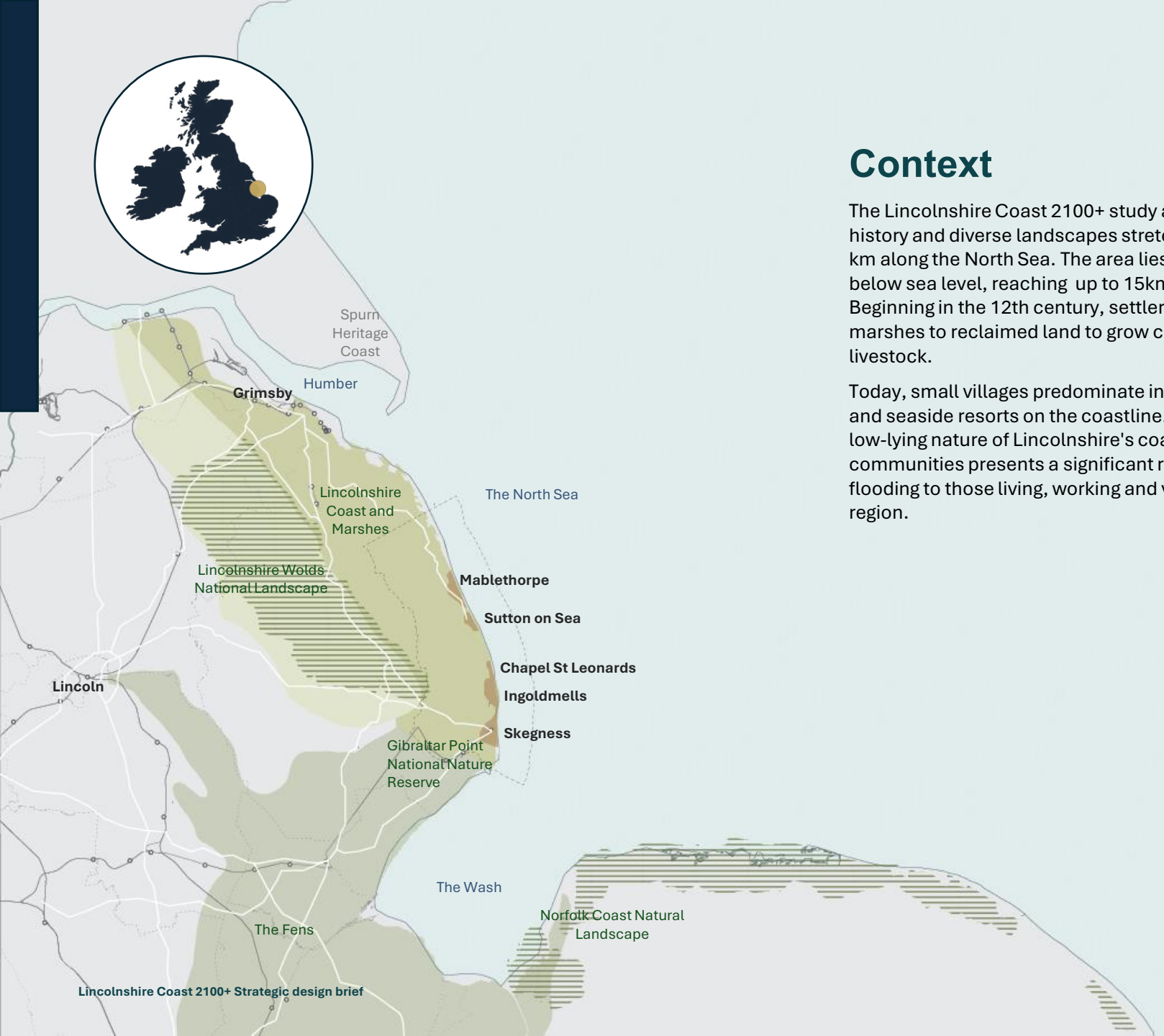


Context

The Lincolnshire Coast 2100+ study area has a rich history and diverse landscapes stretching for 38 km along the North Sea. The area lies 2-4 meters below sea level, reaching up to 15km inland. Beginning in the 12th century, settlers drained marshes to reclaimed land to grow crops and graze livestock.

Today, small villages predominate in the hinterland and seaside resorts on the coastline. However, the low-lying nature of Lincolnshire's coastal communities presents a significant risk of coastal flooding to those living, working and visiting the region.

Existing sea defences including sand dunes, beaches and concrete structures currently provide resilience to coastal erosion and flooding, however much of the infrastructure is aging and reaching the end of its serviceable life.

Set within the current economic context, and reflecting on the broader uncertainties associated with climate change, the current flood risk strategy, which includes beach nourishment to protect aging assets, is financially unsustainable and unlikely to deliver a suitable level of protection beyond 2040.

Strategic design objectives

Towards a transformative solution

Developing **a transformational solution for flood risk management** along Lincolnshire's coastline sits at the core of the Coastal Investment Plan. It must enhance local resilience to reduce the vulnerability of coastal communities and the coastal economy, to climate change.

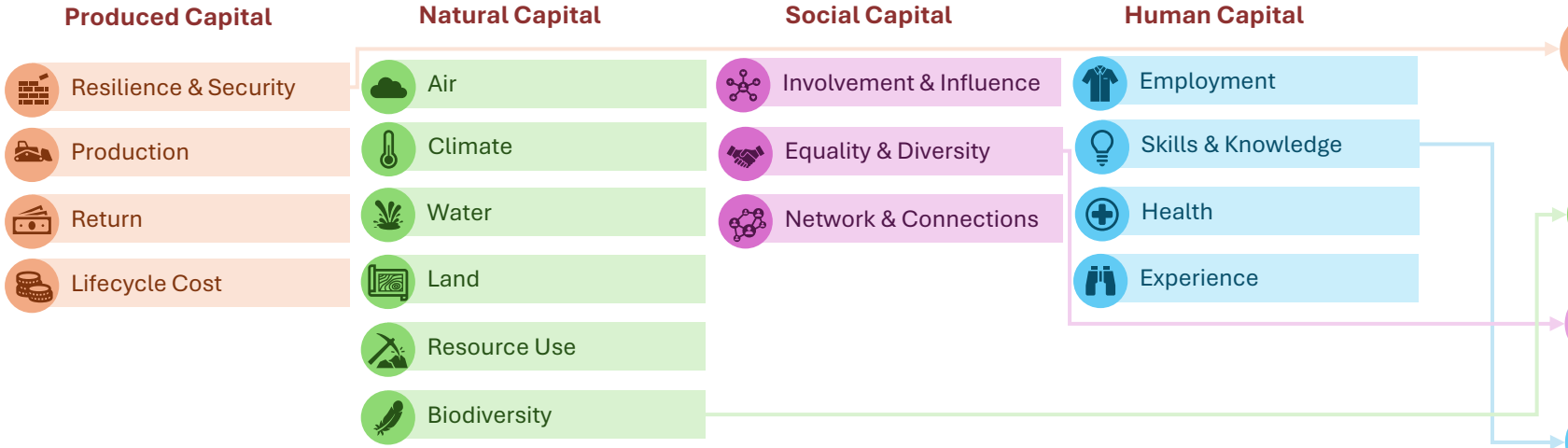
This strategic design brief outlines 43 strategic design objectives that aim to either **directly deliver value** to local communities, businesses and the natural environment or **indirectly enable value** to be created by others in the area.

Pending a defined vision for the area, they have been informed by the priorities outlined in the East Lindsey Local Plan Core Strategy 2018 and the Greater Lincolnshire and Rutland's Strategic Infrastructure Delivery Framework and are framed using the Construction Innovation Hub's Value Toolkit. This categorises value into four capitals: produced, natural, social, and human.

Stakeholder engagement has been a critical component of the strategic design process, with workshops held in 2024 with the Partnership, exploring drivers of change, value objectives, and prioritisation using a "must do, have to do, should do, and could do" framework.

Overall, the strategic design objectives will **underpin and give direction to all future stages of developing the Coastal Investment Plan.** They will act as the North Star for all technical design work and guide the project team towards value-led solutions.

At its core, the Coastal Investment Plan must deliver **a place ready for, and resilient to, flooding and coastal change.** This is the central aim to which all other objectives speak to. Several other examples of "must do" objectives are outlined below.



17 value categories across four capitals

Examples of "must do" objectives

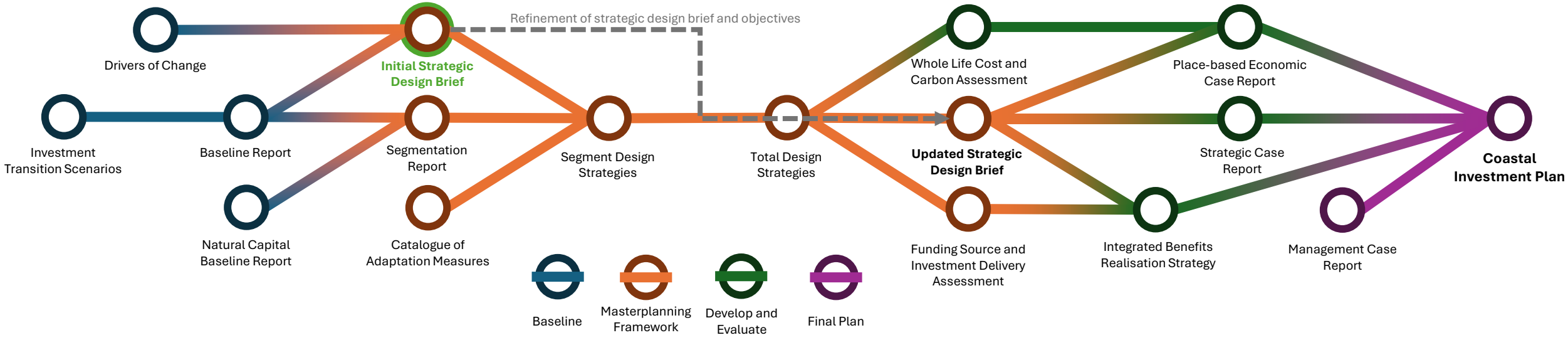
Routemap and next steps

Developing total design strategies

The next steps include conducting three design charettes with stakeholders from across the Lincolnshire Coast 2100+ Partnership, using the strategic design objectives presented in this brief, alongside a segmentation report[1], and a catalogue of adaptation measures[2].

These charettes will inform concept design strategies for individual coastal segments and the project area as a whole and help to develop a Theory of Change to outline the rationale for the project and its intended impacts.

As the project matures, so too will the strategic design objectives. As such, this brief should be viewed as a living document that will be updated and refined as the project progresses. Ultimately, **the objectives will become more robust, specific, and actionable** with each iteration.



Overview of components of different tasks

[1] The segmentation report describes the process through which the project area has been divided to allow for a more in-depth analysis of factors such as coastal flood defence systems, land use, and socio-economic conditions.
[2] The catalogue of adaptation measures is a curated compilation of structural and non-structural measures that address current and future flood risk.

Part B
Context, Method and Strategic Design Objectives

Strategic design brief

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01. Introduction

Context

The Lincolnshire Coast 2100+ study area extends over 38 km of coastline along the north sea and falls within the boundaries of East Lindsey District Council. This area, which lies 2-4 meters below sea level, reaching up to 15 km inland, is characterised by flat, low-lying terrain. The region is a popular tourist destination and encompasses large areas of agricultural hinterland. Despite its attractions, the area is socio-economically challenged, with many parts falling within the most deprived in the country.

The coast has faced significant challenges, including severe flooding in 1953. Since then, a series of man-made interventions have been implemented to support existing natural defences, such as dunes. However, according to a recent study[3], approximately 85 % of the coastal assets have a residual life of 20 years or less.

Funding is currently being sought for beach nourishment and limited maintenance of hard assets until 2040. However, post-2040, **the reliance on hard assets is expected to become increasingly uncertain**. It is therefore likely that government funding will not continue at the same level for the same kind of approach. Alternative funding streams, as well as other cost and affordability considerations will have to be explored.

Arup, in collaboration with One Architecture, have been commissioned to develop a Lincolnshire Coast 2100+ Coastal Investment Plan (the Plan). In the first phase of this project, the aim is to establish the present and future context for the Lincolnshire coast and identify the objectives of the new approach.

Baseline case for action

An extensive baseline[4] establishes the current conditions of the Lincolnshire Coast and provides the foundations and the rationale for investment in the coastal protection on the Lincolnshire Coast. The headline findings are outlined below:

- As the sea defences have continued to age, their overall health has deteriorated and their resilience and reliability as sea defences has decreased. The risk also remains that an extreme surge event may exceed the current standard of protection.
- With approximately 22,600 Ha of protected areas, there are opportunities to boost 'blue' and 'green' carbon sequestration and biodiversity net gain in the area.
- Extensive investment is planned in energy transmission in the region.
- The area remains poorly connected to the wider region with only one rail service in Skegness.
- While groundwater sources are over abstracted, Anglian water are planning new desalination plants as well as a new reservoir.
- The area has been attracting repeat holidaymakers for generations, but there has been under-investment in seaside resorts.
- The local area is expected to grow at a faster rate than the rest of England but the condition of coastal assets, coupled with climate change, could severely disrupt lives and livelihoods across the region if they were to fail.

A new **sustainable and resilient approach is required to ensure that coastal erosion and flood risk can be managed** in the long term. This requires an innovative and transformational approach that can deliver economic value, whilst being technically feasible, buildable, environmentally sensitive and financially deliverable.

[3] Jacobs (2023) Residual Life Condition Assessment (3B Report) P04
[4] Arup (2024) Lincolnshire Coast 2100+ Coastal Investment Plan: Baseline report

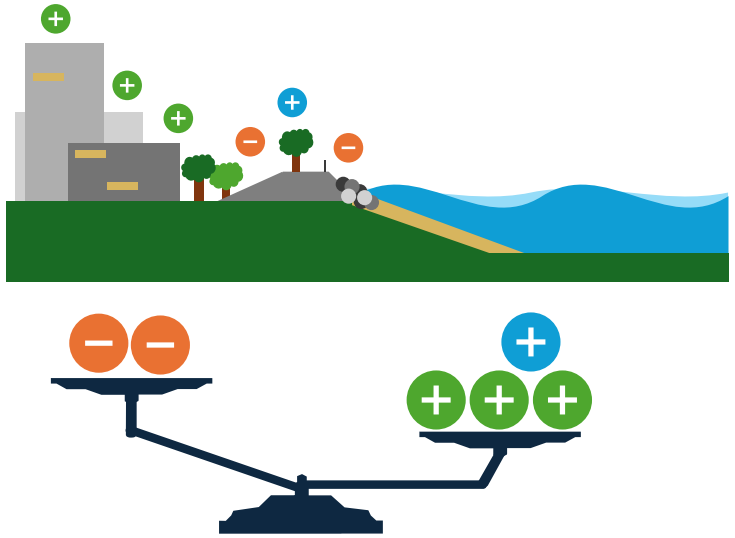
01. Introduction

Transformational approach

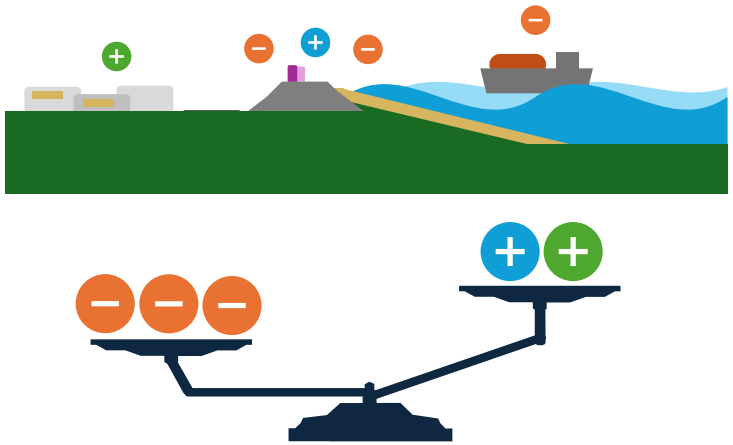
Traditionally, the cumulative value added through damages avoided and co-benefits would outweigh, and therefore justify, the investment in coastal management and defence schemes. Avoided costs could include the reduction in property damage from flooding, while co-benefits might encompass enhanced biodiversity and recreational opportunities.

However, the current flood risk strategy uses beach nourishment to protect aging seawalls and relies on the condition of the sea walls not deteriorating. High maintenance costs, coupled with limited avoided costs and co-benefits, set within the context of increasing climate risks, mean that this strategy is financially unsustainable and unlikely to deliver a suitable level of protection beyond 2040. There is a need to act now to decide what comes next.

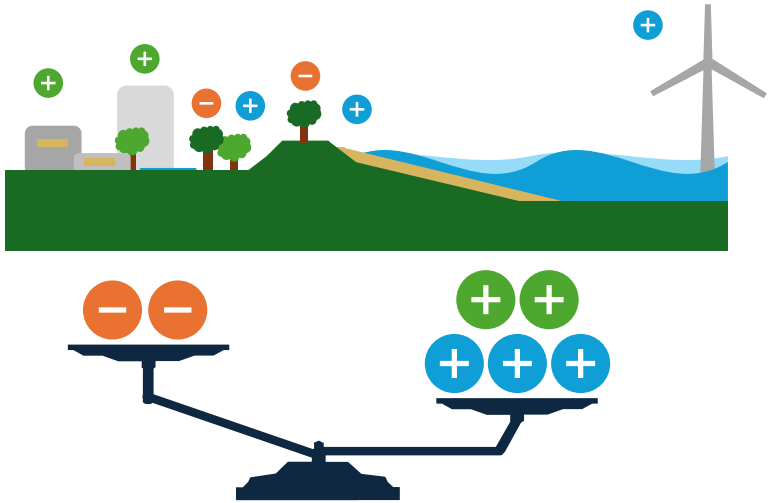
Developing a transformational solution for flood risk management on the Lincolnshire coast sits at the core of the Plan. This approach must deliver economic value, whilst being technically feasible, buildable, environmentally sensitive and financially deliverable.



A *traditional approach* where avoided damages and co-benefits outweigh investment costs



The *current approach* where avoided damages and co-benefits do not outweigh investment costs



A *transformative approach* that enhances local resilience, where the benefits outweigh the costs.

Avoided costs Co-benefits Investment cost

Moving towards a transformational approach

01. Introduction

Resilience to climate change

The Plan will need to **enhance the resilience of the area to a number of climate hazards**.
Specifically, the plan must deliver a place that is ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100, whilst enabling enhanced resilience of the East Lindsey Coastal Area to changing pluvial and fluvial flood risks.

Furthermore, assets themselves will need to be resilient to a range of climate hazards. These are outlined below. If left unaddressed, these hazards will have adverse effects on communities, landscapes, nature, and the built environment. Primary hazards are the core focus of the must do resilience objective. The project could enhance resilience to secondary hazards, where feasible.

There is significant uncertainty as to the severity of these hazards through to 2100[5]. The Plan will need to respond to this uncertainty. Without addressing the uncertainty that climate change presents, the Plan will lack the surety needed to foster a place in which value can be created.

	Land hazards	Ocean hazards	
Primary hazards	Increasingly **heavy precipitation** and **pluvial floods** can increase flood risk	**Sea level rise** in the region This will substantially increase flood risk.	Primary hazards
Primary hazards	Increasingly **heavy precipitation** and **river floods** can increase flood risk	More **extreme storms** could increase wave heights and storm surges, compounding sea level rise risks.	Primary hazards
Secondary hazards	Worsening **droughts** can affect water supply and the environment	**Extreme storms** and **sea level rise** could affect sediment transport and increase coastal erosion.	Primary hazards
Secondary hazards	**Temperature extremes** and **extreme storms** can affect people, nature and the build environment	**Temperature extremes** affect people, nature and the build environment	Secondary hazards

Primary and secondary climate hazards relevant to the Lincolnshire coast

[5] Uncertain drivers such as Marine Ice Cliff Instability could potentially increase global mean sea level rise to over 2m by 2100.

01. Introduction

Framework for the strategic design brief

This brief describes the value we want to deliver using a new sustainable and resilient approach to coastal erosion and flood risk management on the Lincolnshire coast. To unlock value, strategic design objectives will guide all future phases of our work. They articulate place-based ambitions in the context of broader regional plans and emerging national policies and strategies. The value that the Plan creates should ideally speak to a long-term Vision and Missions for the project area. Work is being undertaken in parallel to explore these topics.

The strategic design objectives include both value directly delivered by the Plan, and the wider value that the Plan will enable. Here, delivered value refers to value that is directly created by the outcomes of the Plan. Enabled value, on the other hand, refers to value creation that is supported by the Plan, but relies on additional external investment or action to be fully realised.

Value type	Definition
Delivered	Benefits unlocked directly by the Coastal Investment Plan.
Enabled	Benefits supports by the Coastal Investment Plan, but reliant upon additional action or investment.

Value definitions

At this stage, the vision and objectives outlined in the Lindsey East Lindsey Local Plan Core Strategy 20184[6] and the long-term strategic vision set out in the SIDF[7] have informed the development of the strategic design objectives. These are present in more detail on the following slide. Future iterations of the strategic design brief will be informed by the design strategies that themselves are guided by this initial version. In addition, the Vision and Missions work that is underway will help to make the objectives outlined more robust, specific, and actionable.

To frame the objectives, we have used the Construction Innovation Hub's Value Toolkit, which is used to identify, organise and communicate objectives across the whole-life of built environment project and programmes. Designed by government and industry, the Value Toolkit uses a four capitals approach, aligned with HM Treasury's Green Book, against which public sector investment decisions are made.

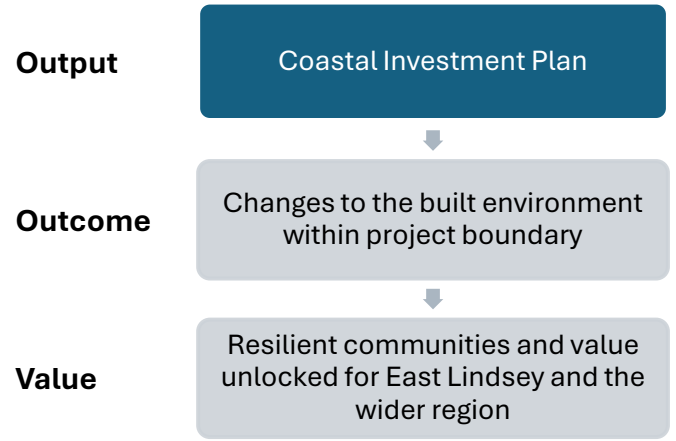
Natural Capital values the natural environment, addresses solutions to climate impacts and provides benefits to society throughout the full lifecycle of the built asset.

Social Capital refers to influence and consultation, equality and diversity, networks and connections as well as the changes people experience in the areas due to built assets.

Human Capital encompasses employment opportunities, skills development, individual health, and wellbeing as well as an assets' capacity to influence these factors.

Produced Capital encompasses a combination of capital cost, operational coast and revenue, thereby covering the whole of the direct monetary spend on the project over its whole life. The man-made elements include indicators of the efficiency and quality of design, construction and operational processes.

This brief, alongside the Baseline, is the start of an iterative process to be followed by the development of conceptual design strategies, resulting in an updated strategic design brief. The updated strategic design brief will then be used to compare and evaluate different design strategies as the masterplanning framework is developed. The strategic design brief will then inform the case for investment that is developed in later tasks.



Project results

[6] East Lindsey District Council (2018) East Lindsey Local Plan Core Strategy 2018
[7] Greater Lincolnshire Infrastructure Group (2023) Greater Lincolnshire and Rutland's Strategic Infrastructure Delivery Framework

01. Introduction

Existing visions

In the absence of a defined Vision and Missions for the Lincolnshire Coast 2100+ project area, which is under development, two existing strategies have informed the development of the iteration of the objectives that are presented in this brief.

East Lindsey Local Plan

The first, the East Lindsey Local Plan Core Strategy 2018 outlines the vision and strategic policies for the district's growth and development up to 2031. It focuses on sustainable development, housing growth, economic development, and environmental protection. Key policies address affordable housing, employment, transport, and flood risk management. Specifically, it outlines six objectives for East Lindsey:

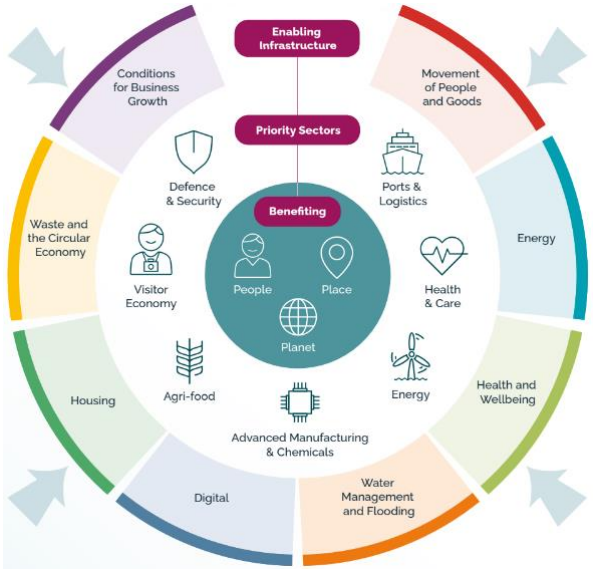
1. A network of thriving, safer and healthy sustainable communities, where people can enjoy a high quality of life and an increased sense of well-being and where new development simultaneously addresses the needs of the economy, communities and the environment.
2. Quality affordable and open market housing to try and meet the differing needs of the District's residents.
3. A growing and diversified economy that not only builds on and extends the important agriculture and tourism base but supports the creation of all types of employment.
4. A commitment to address the issues of deprivation and rural isolation to make an inclusive, equal and diverse district.
5. A high-quality environment that makes the most of its special qualities, particularly the coast, the Lincolnshire Wolds and the historic market towns.
6. A commitment to tackling the causes and effects of global climate change through local action.

The core of these objectives are addressed in many of the strategic design objectives presented on subsequent slides.

Greater Lincolnshire and Rutland's Strategic Infrastructure Delivery Framework

The second, the SIDF focuses on enhancing strategic infrastructure to support economic growth, sustainability, and inclusivity in Greater Lincolnshire. It aims to harness priority sectors' productivity, strengthen regional connectivity, and promote inclusive growth. The diagram on the right summarises the SIDF's priority sector approach. It outlines water management and flooding, the remit of the Coastal Investment Plan, as an enabling strategic infrastructure that is essential to driving growth in each of the priority sectors.

Within the context of the Lincolnshire Coast 2100+ project, the strategic visions for several of the priority sectors outlined in the SIDF have informed the focus areas of the strategic design objectives. These are primarily the visitor economy and agri-food, in addition to energy and health and care.



SIDF 2023 – A Priority Sector Approach

01. Introduction

Drivers of change

Our baseline assessment gives an understanding of the strengths and weaknesses of the Lincolnshire coast, pertinent to flood risk. It also outlines threats and opportunities; but to consider these further it was important to develop a picture of the drivers of change. The drivers of change are future external conditions that (a) could impact the Lincolnshire coast, creating risks the Plan would need to manage or opportunities the Plan can capitalise on, or (b) the Lincolnshire coast (and the Plan) could influence, at a local, regional or national level.

To explore this, social, technological, economic, environmental and political trends, informed in part by the SIDF, were identified. These trends included changing demographics, widening inequalities, global instability, job automation and increasing ocean temperatures, among others.

Based on an understanding of these trends, several illustrative *future narratives* were developed that might impact on or be influenced by the Plan. The boxes on the right summarise these. They are all considered plausible but are uncertain, i.e., they may or may not happen.

This step allows us to consider future uncertainty, promoting a flexible and adaptive Plan that helps realise a desirable future, whilst preparing for possible risks.

Social future narratives

Caravan communities of the future – changing size, age, diversity, nature (permanent vs seasonal).

Increased attraction for living on the coast. Linked to remote work, retirement, cost of living.

Growth (and then decline) of UK population. Higher share of retirees – with varied needs.

Increasingly diverse UK, for coastal locations as well as cities.

Growth in UK tourism – domestic and international visitors. New seasonal visitors to Coastal Lincs, alongside Holiday Park tourists.

Increasing concern around climate and biodiversity crises – changing public expectations.

Economic future narratives

Changing climate in Southern Europe (extreme heat) and growth of global middle-class lead to significant growth of UK visitor economy, including Coastal Lincs.

UK push for food security places increased value on domestic food production. Controlled environment growing systems help adapting to climate change.

Automation reduces jobs per output in agri-food sector, but automated manufacturing for food supply chains boosts Lincs economy.

Lincolnshire increasingly important for the UK's clean energy system: wind, solar and offshore grid connections.

Growth in health and social care sector, digital innovation and focus on preventative care, including access to clean and green spaces.

Environmental future narratives

The UK focus shifts from 'net zero' to 'net negative'. Coastal Lincs plays a role in removing and storing carbon, via land management, geo-engineering and nature restoration.

The North Sea significantly warms and acidifies, hugely impacting biodiversity and fishing sector.

Trend of both 'too much rain and too little' rain intensifies.

Pressure for sustainable approach to fertiliser use result in a re-think of farming methods.

Incentives for net environmental gain – on land and at sea – increase.

Climate hazards intensify beyond flood risk.

Future narratives. Further information about the drivers of change is provided in Appendix A.

02. Method

Research and Workshops

Drivers of change workshop

In August 2024, stakeholders were convened for an online workshop to explore the drivers of change that could impact the Lincolnshire coast. A number of future narratives were explored in this session, across social, economic and environmental futures. During the workshop, stakeholders were asked to rate the impact and plausibility of each narrative. The insights gained helped to shape future sessions on strategic design objectives.

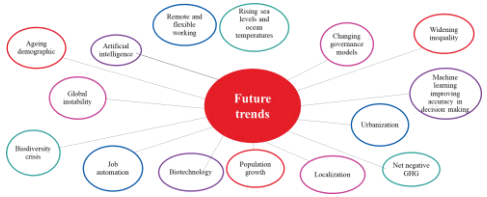
First strategic design objectives workshop

In October 2024, stakeholders were reconvened to explore ideas for value objectives. To frame the objectives, the Construction Innovation Hub's Value Toolkit[8] was used, with its 17 categories across the four capitals acting as guidelines. Informed by the prior work on drivers of change, workshop participants were asked to identify and discuss what objectives they believed the Coastal Investment Plan should *deliver* and *enable*.

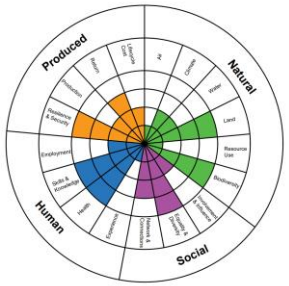
Second strategic design objectives workshop

Following a process of refinement and rationalisation of over 120 individual notes collected during the previous workshop, participants at a follow-up workshop in November 2024 were presented with 43 solution-agnostic strategic design objectives to prioritise. Following a MHSC (Must, Have to, Should, Could) process, stakeholders were able to identify ten "must do" priorities, spread across all four capitals. These represent the north star for the project. The others were categorised as either "have to do", i.e. current statutory requirements, "should do" or "could do". These are presented more fully in the following section.

Aug '24
Drivers of Change Workshop



Oct '24
First Strategic Design Objectives Workshop



Nov '24
Second Strategic Design Objectives Workshop

Timeline of engagement

[8] Available at: https://constructioninnovationhub.org.uk/our-projects-and-impact/value-toolkit/

03. Strategic design objectives

Prioritisation and categories

This section describes the strategic design objectives for the project. The objectives are presented as either “must do”, “have to do”, “should do”, or “could do”.

Those objectives that stakeholders deemed to be the “must do” objectives are instrumental to the Plan – there is no scheme without these objectives being met.

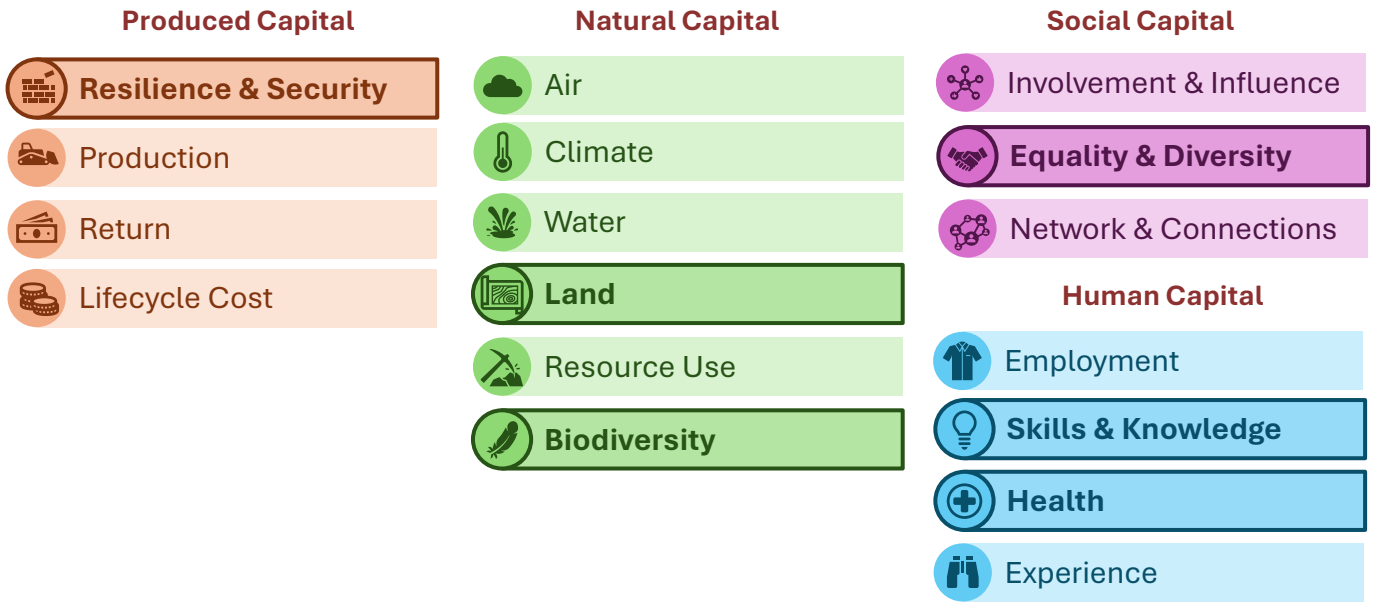
There are also several objectives that are statutory compliance requirements with any investment made under the Plan. These have been classified as “have to do (at present)” objectives.

The “should do” objectives are those where there is value to be delivered, where feasible. They are important to consider and take forward, but they do not provide the strategic case for the project.

Finally, the “could do” objectives are not considered priorities, based on the outcome of the prioritisation workshop. The ‘could do’ options can be used to describe the ‘Do Maximum’ or ideal end project, whereby all ‘could do’ options are achieved.

In addition to this prioritisation, each objective is **linked to one of the 17 value categories** across the four capitals outlined in the Construction Innovation Hub’s Value Toolkit. A full descriptions of each of the value categories is available in Appendix B. Those identified as the highest priority through the stakeholder engagement process are further highlighted on the right.

Later iterations of the strategic design objectives, informed by the Vision and Missions that are currently under development for the project area as well as the design strategies, which will be informed by this iteration of the objectives, will be **more robust, specific, and actionable**.



17 value categories across four capitals. Those in bold have been identified as having the highest priority

03. Strategic design objectives

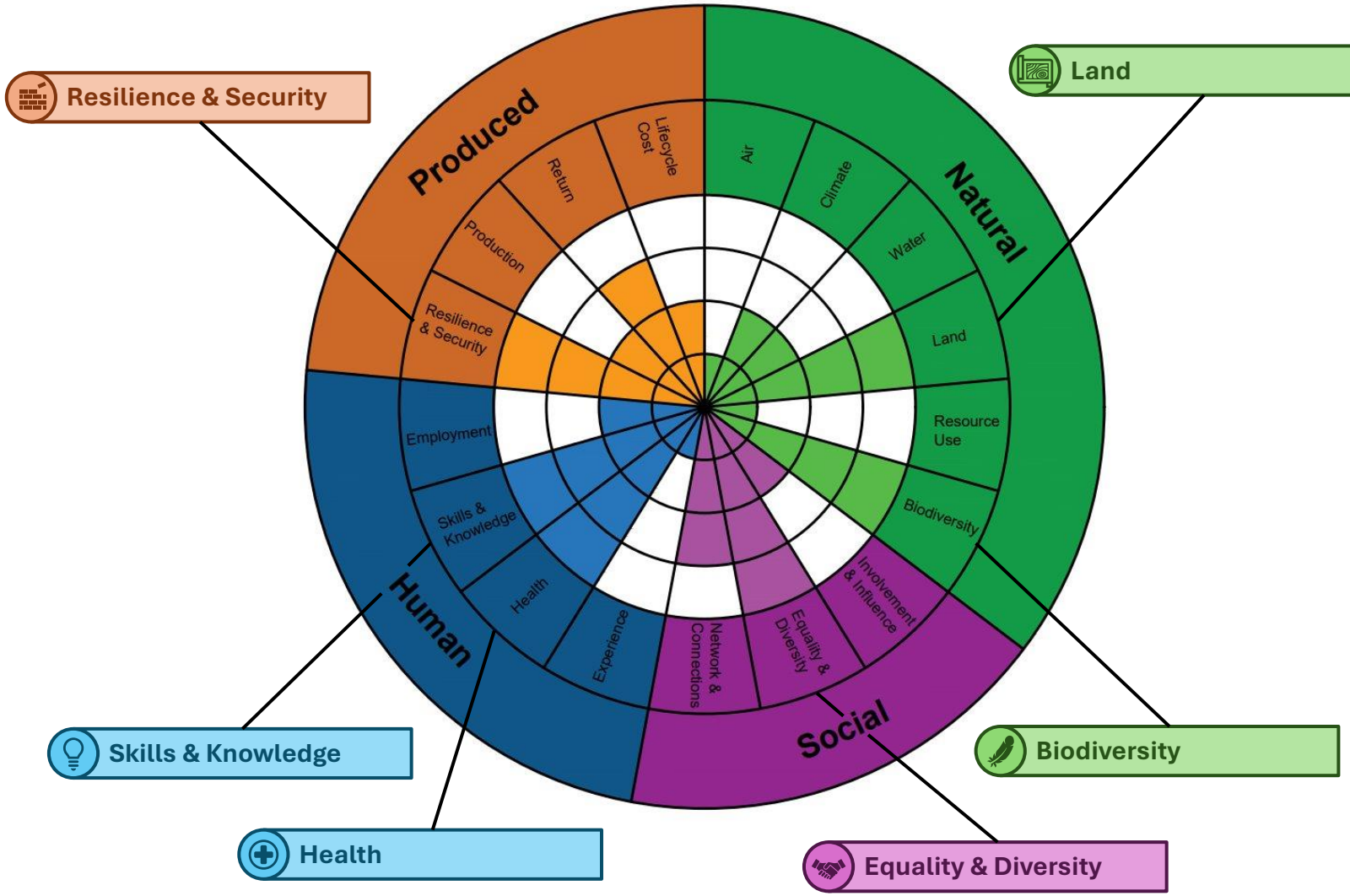
Summary – value wheel

Following the Construction Innovation Hub approach, a visual representation of the strategic objectives captures and reflects the priority categories, where the number of filled sectors visually represents the prioritisation of each category. A single filled sector denotes a ‘could do’ priority, two sectors indicate a ‘should do’, and three or four sectors signify ‘have to do’ and ‘must do’ priorities, respectively.

It is evident from the value wheel, that the identified **objectives capture a broad set of categories**, suggesting a balanced approach across all four capitals. Additionally, at least one category per capital is represented in the “must do” objectives.

Prioritising elements of each capital helps to ensure resilient and comprehensive strategies are developed that address challenges holistically, rather than focusing on one area at the expense of others.

All 43 objectives are outlined over the following pages, starting with the “must do” objectives. They are designed to be solution-agnostic. Achieving each of the objectives does not hinge on any specific approach or intervention being adopted by the Plan. As such, they are **framed as aspirational and beneficial to communities**, but not prescriptive or restrictive. Each objective seeks to either deliver or enable value.



Value wheel with priority categories highlighted

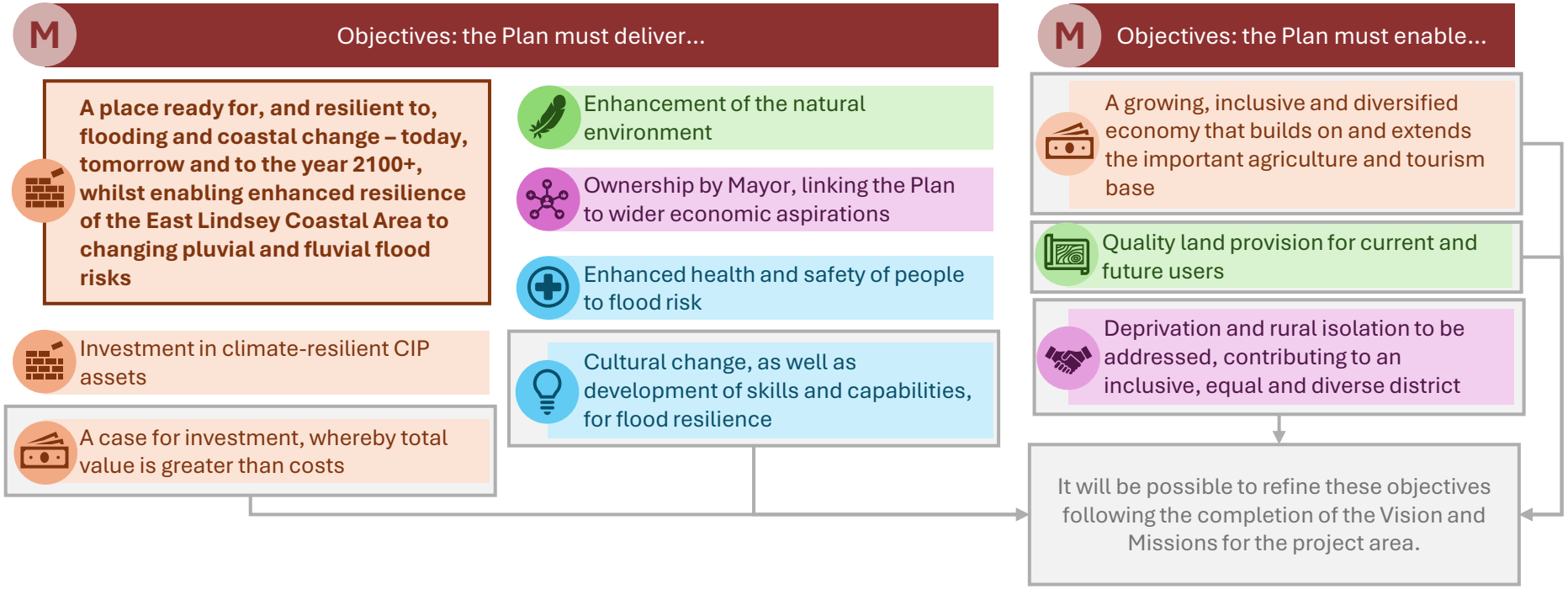
03. Strategic design objectives

“Must do” objectives

The “must do” objectives represent the core of the Plan. There is no scheme without these objectives being met. Collectively, they act as the foundation on which opportunities for the betterment of communities and the natural environment are built.

Delivering **a place ready for, and resilient to, flooding and coastal change** can be seen as the central aim to which all other objectives speak. Therefore, it is crucial that the Plan enhances the resilience of the area and its assets to a number of climate hazards.

Objectives are highlighted where the ongoing Vision and Mission work is likely to influence later iterations.



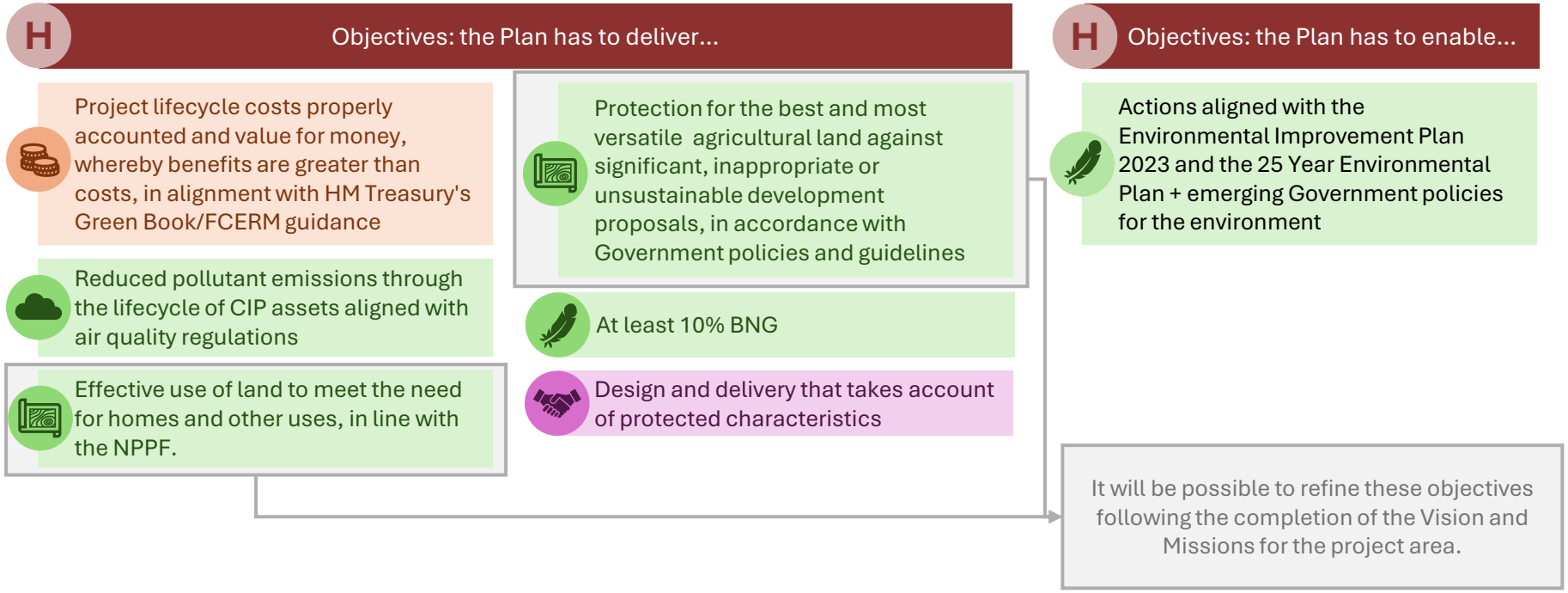
03. Strategic design objectives

“Have to (at present)” objectives

There are several objectives that, at present, would form statutory compliance requirements for any investment made under the Plan.

Given the timescale of the Plan, there is some uncertainty around which of these will still be requirements when the Plan is implemented. Similarly, **new statutory requirements are likely to emerge** that have not yet been considered.

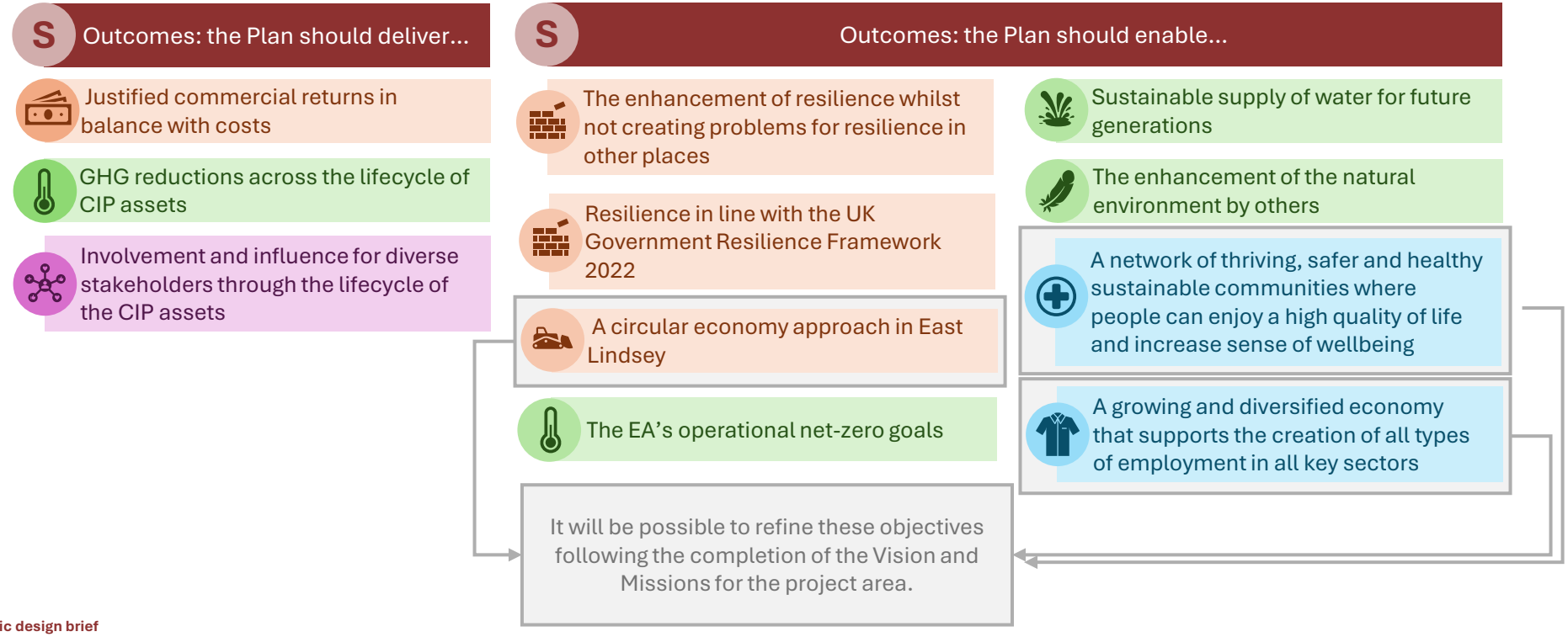
The statutory requirements outlined here are not comprehensive but rather **act as a guide to the kind of requirements that what would need to be considered**. The objectives that are outlined here speak to a Plan that is fiscally, environmentally and socially responsible.



03. Strategic design objectives

Should do objectives

The “should do” objectives are those where there is value to be derived, where this is feasible. They are important to consider and take forward, but they do not provide the strategic case for the project. Rather, many of these objectives look beyond the boundaries of the project, towards **enabling produced, natural, and human value to be created across a wider area**.



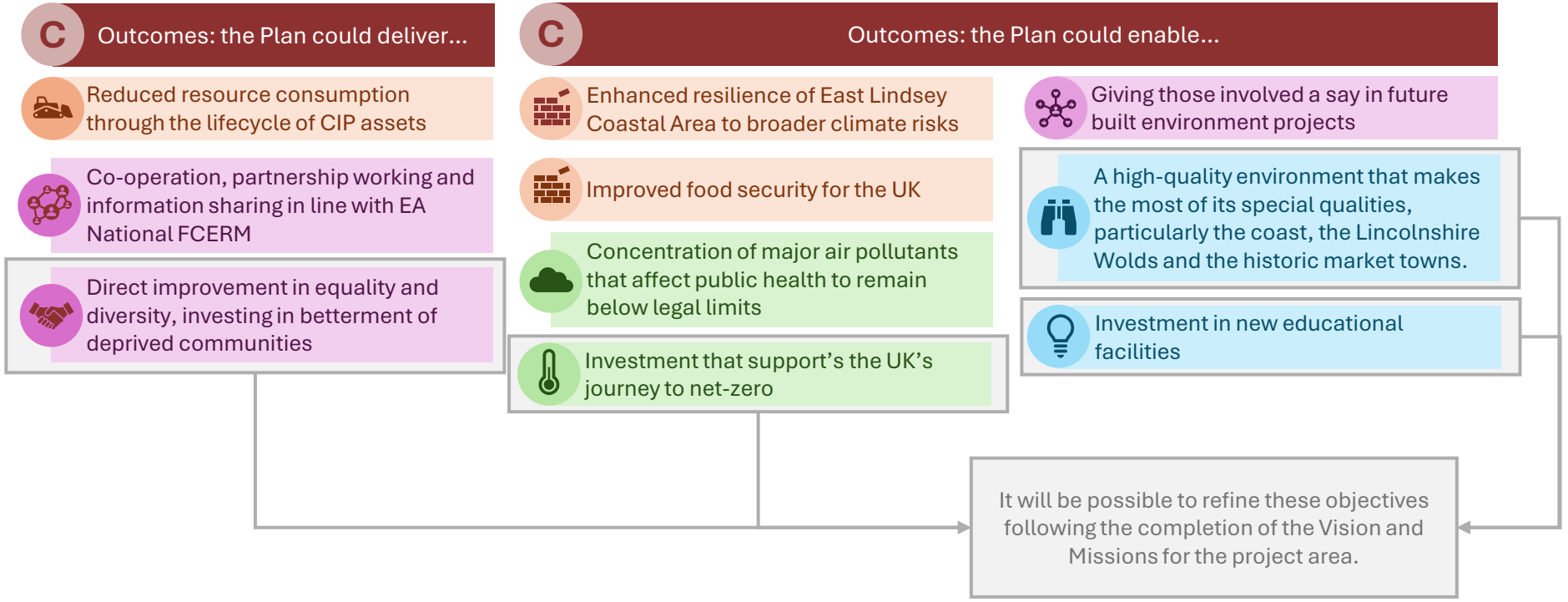
03. Strategic design objectives

Could do objectives

The objectives below are not considered high priorities by the participants of the Prioritisation Workshop, and as such have been categorised as ‘could do’. These objectives can be **used to describe the ‘Do Maximum’ or ideal end project**, where all ‘could do’ options are achieved.

Having ‘could do’ objectives helps create options between the ‘Do minimum’ and ‘Do maximum’ whereby certain ‘could do’ objectives are achieved to differing degrees.

The ‘could do’ objectives can **also help to inform future social value strategies and plans**. Achieving these could de-risk the project by unlocking broader community benefits that increase political and community buy-in to the project.



04. Further development

Refining the strategic design objectives

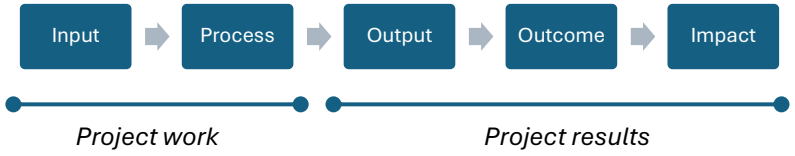
Going forward, we will ensure the objectives set out for the Plan are robust, specific, and adapted to the Vision and Missions that are under development for the project area. In addition, we will align these objectives with national government guidelines for public sector expenditure on projects and programmes.

This approach will help us to **create a clear, actionable plan** that meets all regulatory requirements and effectively addresses the needs of the coastal region.

The figure to the right outlines the key success factors for refining objectives. It also contains the next steps to be taken to further refine the strategic design objectives which will continue to be developed as we put together the cases.

The **next iteration of the strategic design objectives will be informed by the outcomes of three upcoming design charettes**, conducted with stakeholders from across the Lincolnshire Coast 2100+ partnership. Ultimately, these charettes will result in the creation of three concept design strategies for the entire project area.

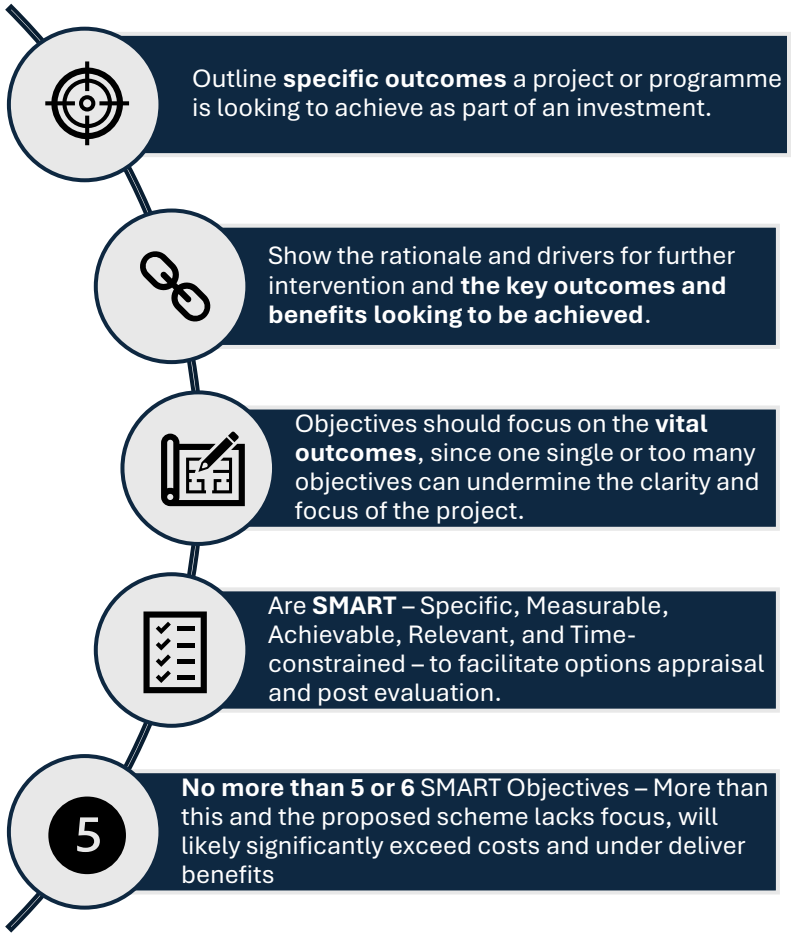
As we carry out the design charettes, we will **develop a Theory of Change**, which is a comprehensive overview of how and why a project is being delivered, as recommended in the HM Green Book guidance. This will be a robust way to outline how the Plan will get from its inputs to meeting its objectives and delivering intended impacts; it will detail the rationale for change, the strategic context and case for change, as well as any barriers and opportunities.



Theory of Change Model

We will then assess the Theory of Change against the strategic design objectives to draw the causal link between the two. This will help us review the alignment of the objectives to see if they need to be refined or to flag misalignment between inputs and objectives or impacts.

This process initiates the development of the strategic case and the rest of the Plan, as outlined in Part A of this brief, whilst ensuring an evaluation can be carried out. The final Theory of Change will be contained within the updated strategic design brief.



Key success factors