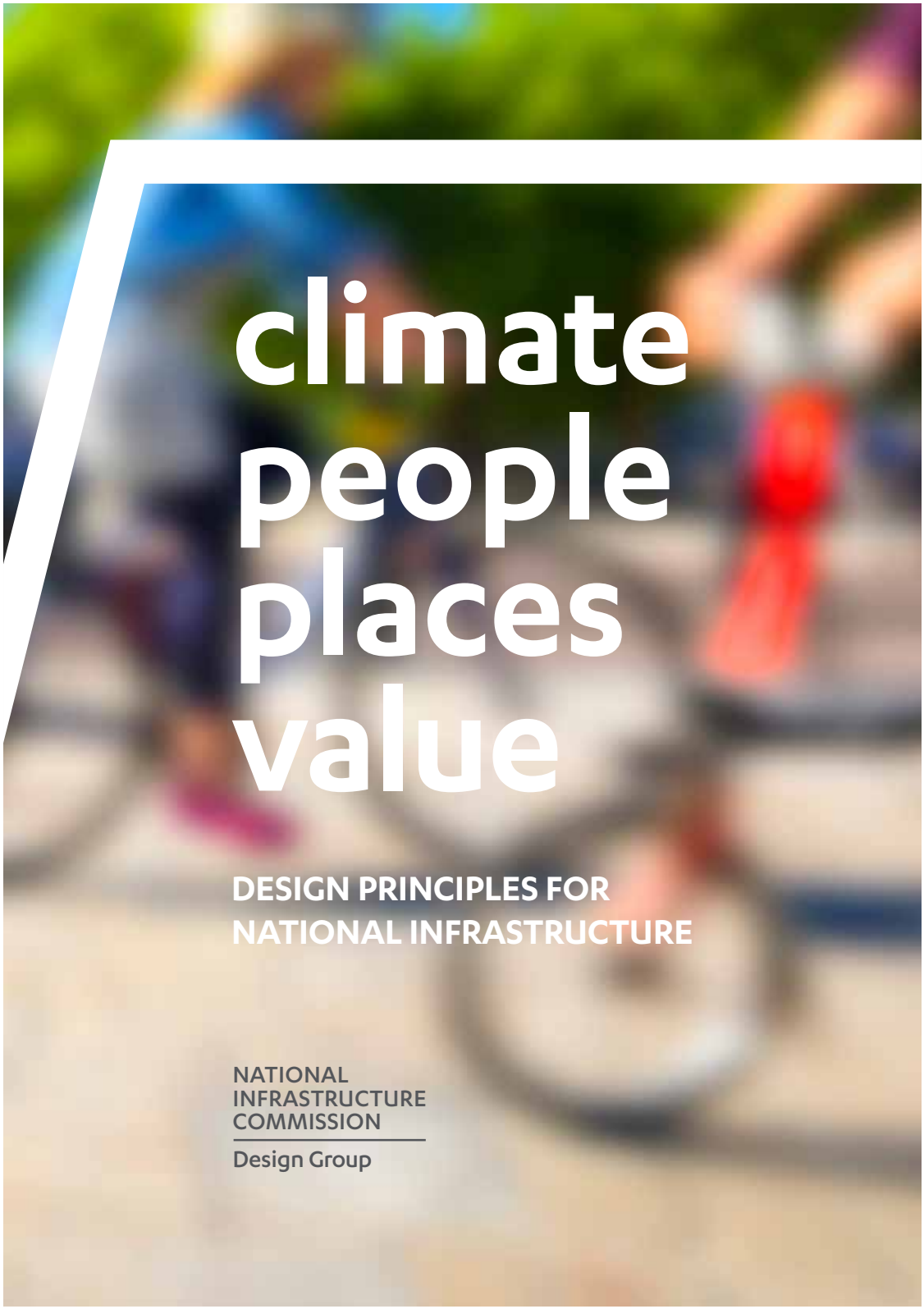


DESIGN PRINCIPLES FOR NATIONAL INFRASTRUCTURE

NATIONAL INFRASTRUCTURE COMMISSION

Design Group

A design challenge for national infrastructure

Our first National Infrastructure Assessment said that the Commission would publish design principles for national infrastructure based on advice received from the independent National Infrastructure Design Group. This clear and accessible document fulfils that important commitment.

This is the first document of its kind for the UK and it meets a clear demand for this type of guidance. It merits a wide audience among everyone involved in the planning, constructing and maintaining of national infrastructure. I am proud to publish it in the Commission's name.

Sir John Armitt

Chair, National Infrastructure Commission

The National Infrastructure Commission established an expert design group because we believe the UK needs renewed ambition for the quality of our infrastructure. The group brings together respected leaders in design, with experience spanning architecture, transport, landscape and engineering, to champion good design for infrastructure—and I am delighted to be its chair.

In consultation with colleagues across infrastructure sectors, we have developed four design principles to guide the planning and delivery of major projects: climate, people, places and value. These principles should guide the projects which will upgrade and renew the UK's infrastructure system. They should be applied to all economic infrastructure: digital communications, energy, transport, flood management, water and waste.

The Commission is setting a design challenge for our industry through this document. We want to inspire everyone involved in creating the nation's infrastructure to embrace these principles and think about what constitutes good design. Whatever your role, you can play a part in ensuring your project leaves a proud inheritance.

We are moving into a decade where many big infrastructure projects will begin. Their legacy will be defined by the quality of their design. We owe it to present and future generations to make them the best they can be. These principles are here to show the way.

Professor Sadie Morgan

Chair, National Infrastructure Design Group
National Infrastructure Commissioner

Infrastructure design

Design is about how something works and how it looks. It matters for infrastructure projects at every scale, whether the infrastructure is visible and used physically by people, or whether it is hidden and used to provide services to people.

Great infrastructure uses design to solve problems and seeks to maximise the different types of benefits it provides over its whole life. When visible, it should look good too. Projects shape the landscape for decades, even centuries. Generations of people will see them, use them and be affected by them every day.

The design process brings together technical and creative expertise to produce infrastructure which provides good value and works well for climate, people and places. But good design does not just come from designers. Every person working on a project should see design as part of their role. And as well as considering design themselves, everyone person should also look to work with others to consider how they can improve design together.

Design is as much about process as it is product. Imaginative thinking about design should be embedded at every step of planning and delivery. The principles ensure a good process leads to a good design outcome.

Infrastructure can and should be a source of pride. The UK has many historical examples of well-designed infrastructure which form part of our cultural heritage. The projects of tomorrow should aspire to the same status.

Demand for design principles

The Design Group has engaged widely with a diverse and inclusive range of people including academics, architects, engineers, environmental bodies, government officials, masterplanners, project managers and public interest groups. They identified a strong demand for design principles to set an ambitious vision for the design of national infrastructure. These principles were developed in line with the diverse views we heard.

These principles had to reflect the wider effects and benefits that national infrastructure has when compared to other parts of the built environment. National infrastructure meets a national need and the principles had to form the right vision for these types of projects.

Many of the people consulted thought that too often design has been treated as an afterthought, rather than an integral part of the process. They pointed to various examples of missed opportunities where design could have been used to improve outcomes, which were not unique to any one sector. They agreed a shared vision, appropriate for national infrastructure and clear from the start of a project, would enable projects to deliver good design.

This work is the first of its kind for the UK. While some projects and sectors have led the way and developed their own design principles, nationally significant infrastructure projects have never shared a design vision. It comes at a timely moment, with major construction planned throughout the 2020s. It is also important in the context of climate change, with the UK committed to a target of reaching net zero emissions by 2050.

The design principles for national infrastructure

climate

Mitigate carbon emissions and adapt to climate change

The design of our infrastructure must help set the trajectory for the UK to achieve net zero greenhouse gas emissions by 2050 or sooner. This means opportunities must be sought during design and construction to enable the decarbonisation of our society and mitigate and offset residual emissions.

Our infrastructure has to support an environmentally sustainable society. It should enable the people and businesses using it to reduce their wider climate impacts too. The search for these opportunities should not be restricted to the area within the site boundary.

And good design incorporates flexibility, allowing the project to adapt over time and build our resilience against climate change.

people

Reflect what society wants and share benefits widely

Infrastructure should be designed for people, not for architects or engineers. It should be human scale, easy to navigate and instinctive to use, helping to improve the quality of life of everyone who comes into contact with it. This means reliable and inclusive services. It means accessible, enjoyable and safe spaces with clean air that improve health and wellbeing.

The range of views of communities affected by the infrastructure must be taken into account and reflected in the design. While it won't always be possible to please everyone, engagement should be diverse, open and sincere, addressing inevitable tensions in good faith and finding the right balance. And it should not just be designed for people today. Good design will plan for future changes in demographics and population.

places

Provide a sense of identity and improve our environment

Well-designed infrastructure supports the natural and built environment. It gives places a strong sense of identity, and through that forms part of our national cultural heritage. It makes a positive contribution to local landscapes within and beyond the project boundary. Projects should be inspiring in form and detail, respecting and enhancing local culture and character without being bound by the past.

Good design supports local ecology, which is essential to protect and enhance biodiversity. Projects should make active interventions to enrich our ecosystems. They should seek to deliver a net biodiversity gain, contributing to the restoration of wildlife on a large scale while protecting irreplaceable natural assets and habitats.

value

Achieve multiple benefits and solve problems well

A good design process adds value by defining clearly issues from the outset and providing overall direction for everyone working on a project. It explores every option for increasing value alongside the creative process. This approach means the brief is interrogated rigorously so that opportunities to secure economic, environmental and social benefits are identified, pursued and articulated for local and national audiences.

Good design also finds opportunities to add value beyond the main purpose of the infrastructure. It looks beyond the site boundary to consider the wider benefits the project can bring. It seeks to solve multiple problems well with a single solution. It provides more for less with savings on cost, the environment, materials and space.

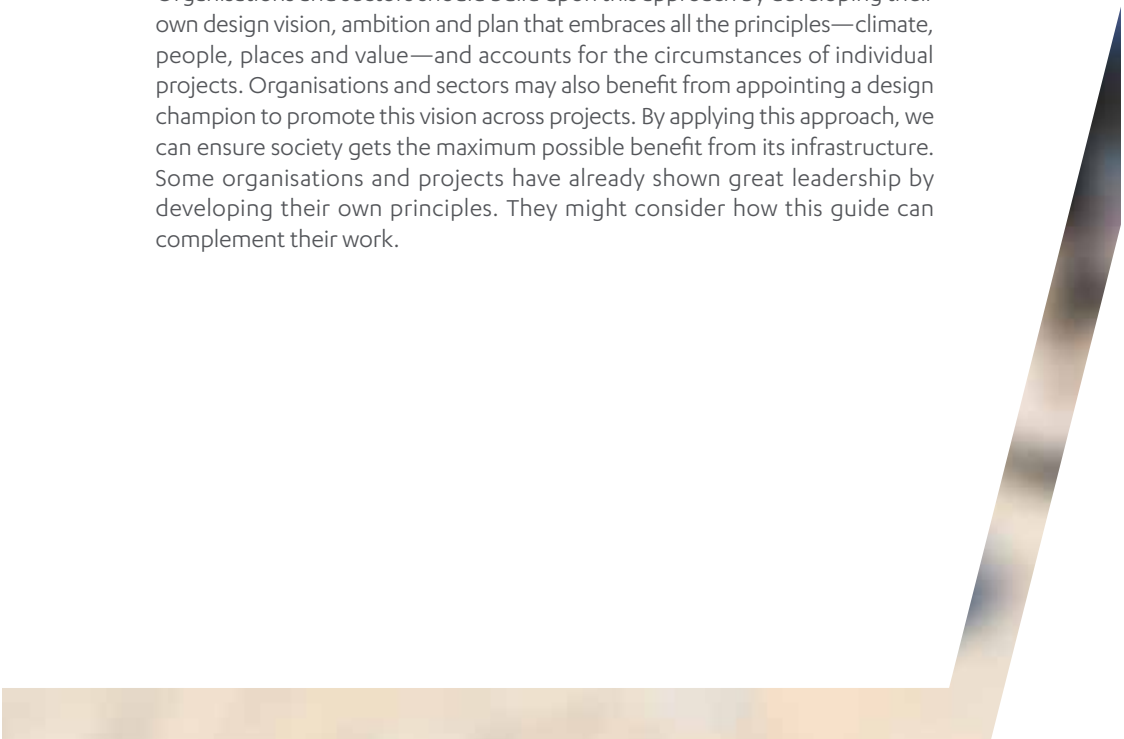
How to use this document

The one-page guide overleaf explains how to use each of these principles. From the start and throughout the project, everyone involved should:

- **appreciate the wider context**
- **consult meaningfully**
- **continually measure and improve**

This approach to applying the principles should be used by anybody commissioning, overseeing or working on an infrastructure project. They should be applied to the design of new infrastructure and the renewal of existing infrastructure.

Organisations and sectors should build upon this approach by developing their own design vision, ambition and plan that embraces all the principles—climate, people, places and value—and accounts for the circumstances of individual projects. Organisations and sectors may also benefit from appointing a design champion to promote this vision across projects. By applying this approach, we can ensure society gets the maximum possible benefit from its infrastructure. Some organisations and projects have already shown great leadership by developing their own principles. They might consider how this guide can complement their work.



Board-level design champions and design panels

The Commission identified a need for championing of good design at board level on projects. The first National Infrastructure Assessment recommended that a board-level 'design champion' be appointed for every infrastructure project. Their role will be to make sure good design is prioritised from the early stages of a project, provide a continual emphasis on that design vision throughout and hold board members and project management to account for delivering those design objectives.

The first National Infrastructure Assessment also recommended that design review panels should be set up for every nationally significant infrastructure project. Design review panels exist on some projects currently and there are some good examples. But the opportunity to do better should not be missed—all major infrastructure projects deserve to have design review panels. Like design champions, review panels need to be involved early enough for their advice to shape project design. They will advocate for improvements to design that will improve the outcomes of the project, taking advantage of opportunities to achieve better value.

The Assessment's recommendations are the start for improving the quality of design of national infrastructure. Design champions and design panels will take forward the spirit of the design principles. They will push for designs that create great places, respond to what people need and want, mitigate society's climate impact and provide good value. They will do this by consulting meaningfully, appreciating the wider context and continually measuring and improving.

Design principles guide for national infrastructure

climate

appreciate the wider context

Always look beyond the boundaries of the project when seeking opportunities to mitigate climate change; design the infrastructure with the flexibility and resilience to adapt to changes in its environment and take advantage of new technology.

consult meaningfully

Use environmental expertise throughout the project to gain understanding of expected emissions; use that expertise to make sure the project takes every opportunity to mitigate emissions and increase resilience.

continually measure and improve

The project must provide a method for measuring whole life emissions over the course of its full lifespan, make changes if it's not performing as it should do and ensure this knowledge is shared.

people

Find opportunities to improve the quality of life for people who live and work nearby and, acknowledging that it won't always be possible to please everyone affected by the project, take steps to mititage negative impacts.

Work with the people who use the infrastructure, the communities who live nearby and the workers who build, maintain and operate it, to ensure the design meets their diverse needs.

Build into the project an approach to monitor people's requirements, including how they change throughout its lifespan; and make alterations if the infrastructure is no longer able to meet those needs.

places

Look for opportunities to use infrastructure to benefit the natural and built environment see how improvements can be made beyond the site boundary to sustain local ecosystems and support local plans for growth and investment.

Talk to and learn from local people and organisations throughout the project to ensure its design complements the local character and culture and supports its ecology, creating places that people can be proud of and enjoy.

Find out what makes places work well, ensuring there are methods and processes in place for the life of the project to underpin any changes required to achieve those outcomes.

value

Bring different professions and skills together from the outset to enable a 'systems approach'; use a shared understanding between different disciplines to resolve multiple problems at once and provide multiple benefits.

Speak to a diverse range of people to create a clear, well supported brief for the project's lifecycle; use this to set objectives, agree the benefits the project will deliver and check that the project is on course to achieve its aims.

Create and use clear measures to find out whether the project is meeting its objectives and providing social, environmental and economic benefits; share lessons learned so future projects can benefit.

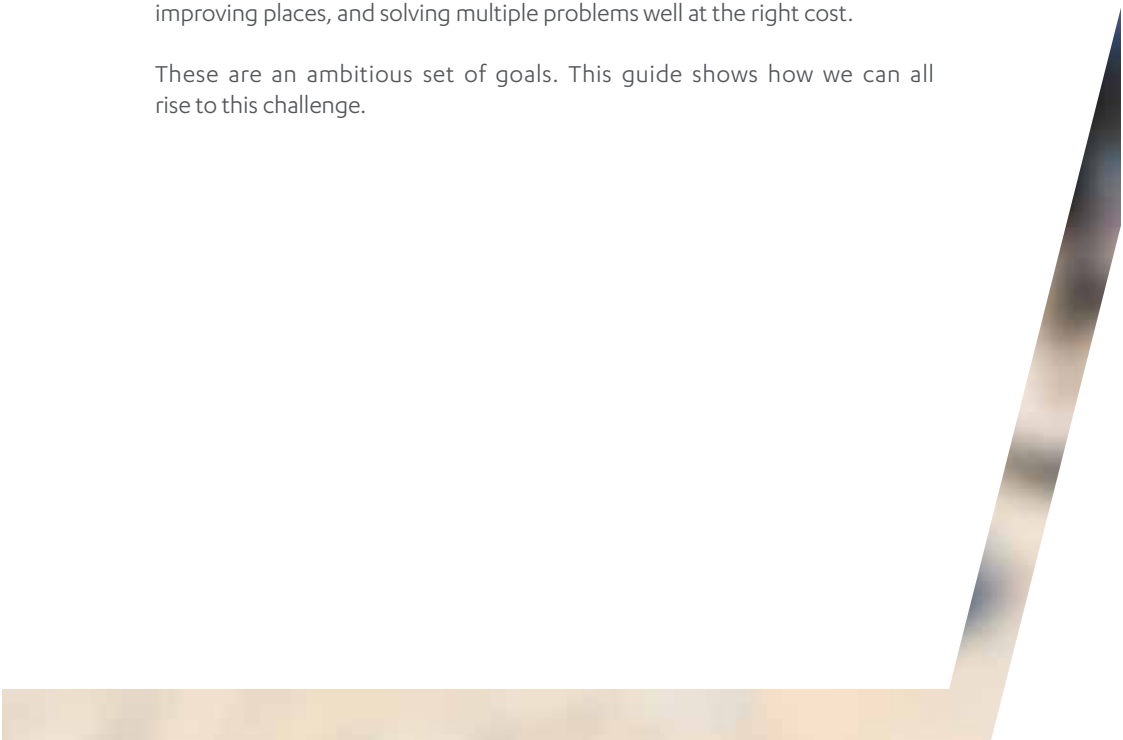
The design principles in action

Projects cannot rely on design champions and review panels alone. Everyone involved in designing national infrastructure—from designers and planners to project managers and sponsors—should use these principles to guide infrastructure design.

Design for national infrastructure projects has been an afterthought for too long. It is time to rediscover our national ambition for well-designed infrastructure. The UK has built infrastructure that has inspired before. It can do so again.

But the infrastructure of the 21st century should not just seek to emulate the best examples we have from the past. It needs to surpass them and meet different needs. Today's infrastructure must address the challenge of climate change, while also making people's lives easier and better, inspiring delight and improving places, and solving multiple problems well at the right cost.

These are an ambitious set of goals. This guide shows how we can all rise to this challenge.



Further reading

The design principles have been developed from research published in two background reports:

- Frame Projects, *National Infrastructure Design Principles: Primary Research Report,* January 2020

This report analyses interviews carried out by Frame Projects to gather views from a wide range of people on good design for national infrastructure.

- Frame Projects, *Design Principles: Literature Review*, January 2020

A literature review which provides background information on the application, scope and nature of existing design principles. The Design Principles have also been informed by previous research commissioned by the National Infrastructure Commission, as well as the National Infrastructure Assessment.

- Publica, *Developing Design Principles for National Infrastructure*, July 2018

A scoping report which set out an approach for developing the design principles.

- Publica, *Design and Infrastructure - Sector Review of Attitudes*, July 2018

A review of attitudes and perceptions towards design.

- Expedition Engineering and Marko&Placemakers, *The Value of Design in Infrastructure Delivery*, July 2018

A research report which examined the value f design through examples of projects.

- National Infrastructure Commission, *National Infrastructure Assessment*, July 2018

Chapter 6 made recommendations on choosing and designing infrastructure.

National Infrastructure Commission

The National Infrastructure Commission was established to provide independent, impartial advice to government on the country's long-term infrastructure needs. It aims to be the UK's most credible, forward-thinking and influential voice on infrastructure policy and strategy. The infrastructure sectors covered by the Commission are transport, energy, flood risk alleviation, digital communication, water and waste.

National Infrastructure Design Group

The National Infrastructure Design Group was set up in 2019 following recommendations made by the Commission in its first National Infrastructure Assessment, published in July 2018. It brings together respected leaders with experience spanning architecture, transport, landscape and engineering to champion good design for infrastructure.

The members of
the Design Group are: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3.


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6.


7.


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10.

1. Professor Sadie Morgan (Chair)
Designer – National Infrastructure Commissioner and Founding Director dRMM Architects

2. Isabel Dedring
Lawyer
Global Transport Leader
Arup

3. Anthony Dewar
Civil Engineer
Professional Head Buildings and Architecture
Network Rail

4. Clare Donnelly
Architect
Director
Fereday Pollard Architects

5. Andrew Grant
Landscape Architect
Founder and Director
Grant Associates

6. Professor Hanif Kara
Structural Engineer
Co-founder and Design Director, AKT II
Professor in Practice of Architectural Technology, GSD, Harvard

7. Madeleine Kessler
Architect
Associate
Haptic Architects

8. Lucy Musgrave
Urban Designer
Founding Director
Publica

9. Judith Sykes
Civil Engineer
Director
Expedition Engineering

10. Louise Wyman
Chartered Surveyor and Landscape Architect
Design Lead
West Midlands Combined Authority

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