Reservoirs in the Landscape: Design Principles

Introduction

The purpose of Reservoirs in the Landscape: Design Principles is to equip those involved in reservoir design with advice and information to create high-quality, nature-friendly schemes that are responsive to the landscape context and needs of a place, enhance the wider area and create inspiring landscapes for people to enjoy.

The Design Principles aim to guide nature's recovery through good design, integrating reservoirs into the landscape while promoting biodiversity, geodiversity, heritage and public access to nature.

The Design Principles are non-statutory and apply to England only. They were created in consultation with water company representatives, their landscape consultants and other stakeholders.

This document aims to complement and build on existing design guidance. These documents include government guidance on Nationally Significant Infrastructure Projects: Advice on Good Design[1], the National Infrastructure Commission (NIC) Design Principles for National Infrastructure[2] and the NIC Project Level Design Principles[3] ; and the All Company Working Group (ACWG) document entitled Water Resources: Design Principles & User Guidance[4].

The NIC Project Level Design Principles advocate a landscape-led approach; this document sets out how this can be achieved.

What does a 'landscape-led approach' mean?

The landscape-led approach means being responsive to the needs, character and evolution of a place, its current forces for change and its existing environmental, social and economic functions. The approach can help to accommodate multi-functional, nature-rich reservoirs into the landscape. This can deliver benefits for the natural environment and people, have strong and recognisable local identities and create resilient landscapes for the future.

Landscapes are not static. They have been changing for thousands of years in response to natural processes and human influences. Landscape is the natural and cultural context which links people with the things they value about a place. The interaction of natural components and cultural patterns creates the rich diversity of England's landscapes. By building on this diversity, we can manage change that benefits current and future generations in face of a changing climate.

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[1] Nationally Significant Infrastructure Projects: Advice on Good Design - GOV.UK (accessed April 2025)
[2] [ARCHIVED CONTENT] Design Principles for National Infrastructure - NIC (Accessed December 2025)
[3] [ARCHIVED CONTENT] Project level design principles - NIC (Accessed December 2025)
[4] ACWG Design Principles Methodology (Accessed March 2024)

The Design Principles

There are five Defining Principles which are supported by a series of Guiding Principles that explore the Defining Principles in greater depth.

For each guiding principle, there are a set of actions which summarise the principle. Defining Principles 1 to 3 cover the approach to the design of reservoirs, while Defining Principles 4 and 5 are more practical and show how the approach could be applied in practice.

Defining Principle 1: Embed collaboration and inter-disciplinary working

The landscape-led approach provides the opportunity to use landscape as the integrating framework in which all other processes occur. The successful implementation of a landscape-led approach depends on collaboration and joined-up working between technical experts, client organisations, contractors and external partnerships (including the local communities and landowners). Working together provides multiple benefits, and an inter-disciplinary team that can detect potential issues and opportunities throughout the process, informing proposals that both respond to their landscape and deliver multiple benefits for nature, people, climate and place.

Guiding Principle 1.1 – Champion inter-disciplinary leadership

Good design is the responsibility of all the disciplines within the project team. The landscape-led approach requires an understanding by all disciplines of the interrelated processes in reservoir design. The full collaboration of all project team members will engage different expertise and skills to achieve the primary objective of water supply while also responding to the site and the wider landscape. This will result in the best outcome for nature, climate, people and place.

Actions

1. Seek collaboration of the whole project team from the start of the project through genuine inter-disciplinary working to deliver the best results for nature, climate, people and place.
2. Use the landscape-led approach as a framework to understand and resolve competing demands for the reservoir design.
3. Employ the landscape-led process iteratively throughout the design process.

Guiding Principle 1.2 – Use the landscape-led approach to engage communities and stakeholders

Landscape-led engagement provides the opportunity to work closely with communities and stakeholders to deliver optimal landscape solutions for nature, climate, people and places. Active and early engagement, including co-design where practicable, with those who know the landscape best, and who are most closely affected by the project will result in place-specific design responses.

Actions

1. Research and gather evidence on the role of established community anchor points within the area to identify all the communities likely to be affected by the proposals, as a ‘pre-engagement’ phase.
2. Work with local education and youth-based organisations as community of the future to feed into the design of the reservoir.
3. Use a wide range of place-based, landscape-led innovative tools for active and early engagement with the host community, relevant communities, and the wider stakeholder group to help them navigate the changes to their landscape. Consider use of co-design of aspects of the reservoir, where practicable, to encourage community support and pride of place.
4. Use the local baseline landscape character and how it is changing and likely to change in response to climate change to help the communities and stakeholder group to gain an understanding of these changes and to help identify the landscape elements which they particularly value.
5. Work with the communities, landowners in the area and wider stakeholders to identify elements to be conserved, to respect the past and its current historical/cultural meaning and identify opportunities for new/enhanced elements which could bring new meaning to the existing landscape.
6. Use the landscape-led approach iteratively through the design process to demonstrate how the community and wider stakeholder inputs have shaped the reservoir design through all stages of the project.

Defining Principle 2: Adopt a sufficiently broad-scale study area

Different parties working on the design of reservoirs will work at different scales. There will be a range, from those involved in wider strategic design issues to those involved in more localised, specific issues. To ensure that reservoirs are integrated into the wider landscape, it is important that in developing the design; those parts of the landscape likely to be influenced are considered. Adopting a strategic broad-scale study area from the outset will ensure that the design vision is informed by the qualities, characteristics and opportunities of the wider landscape.

Guiding Principle 2.1 - Identify the project’s landscape context

The landscape context of the project needs to be clearly defined in order to inform appropriate design responses and thus determine the area needed for the reservoir. At the early stage this is a broad view of the landscape and how it functions. What are its unique geological, topographical, hydrological, ecological and social functions? What is the character of the area? The natural, cultural, historic, perceptual and experiential characteristics of the landscape and its landscape context all need to be identified.

Actions

1. Develop a thorough understanding of the landscape context of the proposed reservoir using robust and systematic analysis.
2. Use published landscape character assessments alongside computer-generated visibility analysis techniques, desktop analysis and field study to identify the landscape context.
3. Use the pre-engagement and engagement work done with the communities involved and the wider stakeholder group as part of the baseline evidence.
4. Understand the extent of the large-scale change needed to accommodate the reservoir and how the reservoir will influence the wider landscape and its catchment.
5. Engage early with relevant bodies if a proposed reservoir design lies within or in the setting of a Protected Landscape, or within or in close proximity to a World Heritage Site which contributes to the natural beauty, special qualities or key characteristics of the Protected Landscape.

Guiding Principle 2.2 - Consider application boundaries and opportunities beyond them

To encompass all that is necessary to ensure the sensitive integration of a reservoir into the landscape, including any opportunities to deliver wider landscape enhancement, the geographic extent of a site's application boundary and its wider visual envelope should be considered early and collectively. This should be done using a landscape-led approach and once the project's landscape context has been identified.

Actions

1. Use the project's 'landscape context' work to identify the likely land take and opportunities beyond the boundaries to deliver multiple benefits for nature, people, climate and planet.
2. Work with the wider inter-disciplinary team to identify any legal constraints on the boundary early in the process and use this work to guide the design approach to the site and the wider area.
3. Explore opportunities/partnerships early in the project to work creatively with the communities involved, the local landowners and other stakeholders to integrate the proposals into the landscape beyond the site boundary.

Defining Principle 3: Understand and address the landscape context

To integrate a new reservoir successfully into the landscape, all proposals should be underpinned by a thorough understanding of a site's landscape context. This understanding is crucial for identifying the challenges posed and opportunities afforded by the new reservoir. To realise the full potential of a reservoir project, the landscape vision and the supporting landscape strategy will need to be developed.

Guiding Principle 3.1 – Analyse the site's wider landscape context and how people relate to it

Detailed research and analysis of the character of the landscape is fundamental to a landscape-led approach. Consider the relationship between people and place, the combinations of elements that make it distinctive, how the landscape functions and how, where, and by whom it is experienced. The integration of landscape character into the design process will result in the proposals being responsive to the landscape context.

Actions

1. Develop an understanding within the inter-disciplinary team of the environmental, social, cultural (current and historic) and economic functions of the landscape of the site and the wider area at the scale appropriate to the proposals.
2. Create a project level landscape character assessment to set out the design baseline. This should cover the site and the wider landscape influenced by the proposals.
3. Use the findings of the community and wider stakeholder engagement work to integrate the value people place on the site and the wider landscape into the project level character assessment to feed into the reservoir design.

Guiding Principle 3.2 – Establish designated sensitivities

The scale of reservoir schemes and the extent of their landscape context mean that early identification of any specific landscape sensitivities, such as Protected Landscapes or other sensitivities relating to the landscape is essential to inform the early stages prior to site selection and subsequently, the design of the scheme.

Actions

1. Check guidance and consult Natural England and the relevant Protected Landscape if the proposed reservoir lies within or in the setting of a National Park or National Landscape, or within or in close proximity to a World Heritage Site (which contributes to the natural beauty, special qualities or key characteristics of the Protected Landscape).
2. Actively apply the duty under Section 245 (Protected Landscapes) of the Levelling Up and Regeneration Act 2023 (LURA) by 'seeking to further the statutory purposes' of Protected Landscapes.
3. Refer to the relevant Protected Landscape Management Plan to understand how the 'special qualities' and thus the natural beauty of the Protected Landscape should assist in meeting the LURA duty and guide the design.

Guiding Principle 3.3 – Build resilience and adaptability to potential long-term change in the landscape

Landscapes are always evolving. The design process must draw on the historical evolution of the landscape and the current and potential future drivers of change. This will ensure that proposals are resilient, adaptable and place specific and can thereby play their part in responding to the climate emergency and the biodiversity crisis.

Actions

1. Undertake a thorough, inter-disciplinary analysis of the potential long-term change of the wider landscape context, to secure resilient and adaptable proposals.
2. Use the National Character Area Profiles and relevant Landscape Character Assessments to help identify wider scale landscape opportunities and drivers for change.
3. Engage with stakeholders, the local community and local heritage and environmental organisations to understand local historical influences and investigate how these could inform future landscape change.
4. Identify opportunities to enhance the landscape to aim for nature and climate positive landscape change that improves resilience.

Guiding Principle 3.4 – Establish a project-specific landscape vision

The landscape-led approach uses the landscape as the integrating framework for the reservoir design. A shared landscape vision will draw together all the early engagement, including any co-design work, with the communities and wider stakeholders and the detailed analysis of the landscape and its wider context. The landscape vision should be an integral part of the overall project vision. This will ensure that proposals integrate well into the landscape context and respond to the landscape, through all the design stages.

Actions

1. Develop and establish the landscape vision collaboratively with the communities and wider stakeholders facilitated by the inter-disciplinary master planning team.
2. Ensure the landscape vision is both accessible to all and engaging in design and content.
3. Use the landscape vision as the tool to engage and gain further support amongst the communities and wider stakeholders.

Guiding Principle 3.5 – Develop a project-specific landscape strategy

A landscape strategy outlines how the landscape vision will be realised. It should provide detail on key strategic aspects of design and outline how change will be managed. It should be a constant reference for those involved in the design of the reservoir and be used to demonstrate the response to the landscape context through the landscape vision.

Actions

1. Develop a landscape strategy to clearly show how the reservoir design will respond to the landscape vision.
2. Include the physical constraints that will influence the design, how the design responds to the local and wider landscape character, the opportunities for climate mitigation and nature recovery and adaptation, proposed public access provision and information on the management of the reservoir over its life cycle.

Defining Principle 4: Enhance the role of the landscape

The landscape is the framework through which wider benefits in infrastructure projects can be delivered. The nature and scale of reservoir projects offer the potential to deliver a broad range of environmental and recreational benefits. Multiple benefits can be delivered by working with others to enhance the quality of the landscape, and create opportunities for nature recovery access to nature, recreation and education.

Guiding Principle 4.1 – Enhance the wider landscape quality

A strong sense of place and identity for the reservoir site will enhance the landscape quality of the site and the wider area. To be sustainable, any enhancement of landscape quality should also secure resilience and adaptability to climate change and nature recovery.

Actions

1. Establish the landscape quality baseline of the reservoir site and the wider area using published and project-specific landscape character data.
2. Work with communities, wider stakeholders and members of other disciplines within the inter-disciplinary project team to find opportunities to enhance the landscape functions for positive benefits including climate mitigation and nature recovery.
3. Use the assessment of landscape sensitivity to determine the approach to landscape quality enhancement. Irrespective of the sensitivity, aim to conserve, enhance and restore positive, place-specific and valued characteristics and functions; for less sensitive sites, this might mean developing new positive and distinctive landscape character.
4. Aim for landscape integration to achieve resilience and adaptability by drawing on the wider landscape context, irrespective of the sensitivity of the landscape.

Guiding Principle 4.2 – Promote engagement, access to nature, and education

Reservoir proposals provide an ideal framework to integrate recreational and educational opportunities, that allow people to connect with the landscape and nature to promote social and economic well-being. The type of recreation and engagement with nature will be determined by the reservoir site and its landscape, local communities' preferences and other sensitivities.

Actions

1. Identify the types of recreation and the associated infrastructure which are appropriate to the landscape context of the proposals and that comply with the proposer's statutory duties on recreation. The types of recreation associated with reservoirs may differ depending upon the character and sensitivity of the landscape.
2. Explore the options for recreation, access to nature and educational benefits early in the design process ensuring inter-disciplinary input.
3. Take opportunities to connect visitors to nature within the reservoir site and create connections to the wider landscape, while balancing the needs of people and nature.
4. Use landscape as the lens through which good quality educational opportunities are offered through the project lifecycle to the full range of age groups within the wider catchment area of the reservoir. Education can help to draw children and young people, university students and researchers, and the wider public into active discussion about future sustainability and environmental planning.

Guiding Principle 4.3 – Secure wider environmental benefits

Reservoirs are of a scale that can significantly contribute towards nature recovery and climate change mitigation by securing wider environmental benefits. The landscape-led approach provides the integrating framework in which to develop a coherent well-functioning landscape that offers multi-functional, integrated and resilient solutions for nature, climate, people and place.

Actions

1. Integrate wider environmental benefits to achieve operational benefits and address long-term maintenance needs, such as clean water.
2. Explore the best combination of multi-functional, integrated solutions for the reservoir and landscape context, using an ecosystems approach or other tools to guide decision-making.
3. Create climate resilient new habitats which connect the site to the wider landscape context; restore degraded habitats and integrate existing ones, where possible.
4. Use the full life carbon assessment of the reservoir project and its land to guide design decisions to avoid, reduce and mitigate carbon equivalent emissions.
5. Employ local, resilient and adaptable nature-based solutions in response to the potential impacts of climate change.
6. Design sustainable buildings and reservoir structures which act as climate and nature positive exemplars in the wider area.
7. Design for health and well-being ensuring equality, diversity and inclusion; leaving a resilient and adaptable legacy for the host community.

Defining Principle 5: Develop landscape-led solutions

Central to every reservoir proposal is a requirement to meet strict functional, safety and security standards, which govern their design, operation and maintenance. The landscape-led process aims to integrate a proposal sensitively into the landscape while also achieving these overarching requirements. The detailed design of a reservoir and all ancillary infrastructure should be informed by this landscape-led process. The process will ensure that the reservoir design responds to the landscape of the site and the wider area and embraces the opportunities and constraints it presents.

Guiding Principle 5.1 – Consider the appropriate scale, shape and profile of the reservoir

Consideration should be given to the scale and shape of the reservoir and its containment structures, to ensure that the proposed reservoir fully responds to the scale and characteristics of the site and its wider landscape.

Actions

1. Design the scale, shape, profile and form of the reservoir using an integrated inter-disciplinary team involving structural and geotechnical engineers, dam safety specialists, limnologists, landscape architects, ecologists and other environmental professionals. This should also include the contributions made by the local communities and wider stakeholders during engagement phases.
2. Consider how the scale of the landscape context should inform the reservoir design.
3. Identify the key features and characteristics in the wider landscape which will inform the shape of the reservoir, its embankment profiles and height of the dam structures. Integrate these features with the carbon balance considerations of the impact on soils (see Guiding Principle 4).
4. Identify opportunities to vary the form and geometry of embankment dams to blend them into flatter landscapes. Use earthworks and/or planting as screening; to help moderate the scale and influence of the reservoir.
5. Consider incorporating features such as islands and landform peninsulas on the inner face of the reservoir to moderate the perceived expanse of the reservoir surface area and increase edge habitats.
6. Use earthworks beyond the reservoir toe to manage the transition to flatter topography. These could be planted where this is characteristic of the landscape context.
7. Use the form and profile of the embankments to integrate recreational infrastructure into the landscape, where the landscape sensitivity can accommodate this type of recreation.

Guiding Principle 5.2 – Sensitively integrate engineered structures and other ancillary infrastructure into the landscape

The structures and ancillary infrastructure associated with reservoirs have the potential to be highly conspicuous and at odds with the landscape context. Once the functional requirements of all associated infrastructure have been established, careful consideration should be given to their influence on the landscape to ensure they respond positively to their context.

Actions

1. Integrate proposed infrastructure by designing it to respond to the character and sensitivities of the landscape. Use nature-based solutions, recovered materials and options which minimise the need for built structures. Ensure all structures are designed for future climate extremes of heat, flood and drought.
2. Explore the following approaches for embankment dam structure designs:
    a. Include contouring, vary the slope profiles and/or visually tie dam structures into surrounding higher ground to mitigate the artificiality of the structure.
    b. Use the form, pattern and species of existing trees and other planting to inform the new planting designs to help integrate reservoir infrastructure into the landscape.
    c. Built-in structures which enable nature to move through the landscape.
3. Explore the following approaches for concrete/masonry dam structures:
    a. Use the landscape character to inform the decision when choosing the tie in point for the dam structure.
    b. Use woodland planting and/or secondary bunding to moderate the perceived scale of the structure where appropriate to the landscape.
    c. Minimise the use of exposed concrete and use local materials and/or architectural treatments to help integrate the reservoir into landscape.
    d. Where appropriate, consider overflow spillways to introduce flowing water to break up visual effect of the dam face, being cognisant of potential erosion risks. Mimic natural function where possible.
4. Explore the following approaches for ancillary infrastructure design:
    a. Locate infrastructure in discreet areas of the landscape or use planting and/or secondary bunding to screen it.
    b. Design discharge infrastructure to visually integrate into natural watercourses.
    c. Design built structures to mimic natural function where possible; use local materials; reference the built vernacular present in landscape and use architectural treatments consistently across the site.

Guiding Principle 5.3 – Consider internal edge treatments, the underwater profile, islands and peninsulas

Strategic and careful design of internal reservoir features such as islands, peninsulas, reservoir edges and underwater profiles can add multifunctional benefits for nature, climate, people and place. To achieve this, collaborative working is needed between landscape professionals, and engineers and ecologists.

Actions

1. Consider the following for internal edge treatments:
    a. Use internal edge treatment designs to help integrate the reservoir into the landscape context guided by the project level landscape character assessment.
    b. Explore opportunities to integrate wetland habitats around the edge of the reservoir.
    c. Consider the species composition of marginal and aquatic vegetation to include in the reservoir edge habitats.
    d. Consider how people might interact with the edge of the reservoir, whether formally or informally, and how this is managed in terms of safety.
2. Consider the following for the underwater profile:
    a. Sensitively design the profile of the draw down zone and the exposed sides of the reservoir to respond to the landscape context.
    b. Explore ways to avoid an abrupt edge to the underwater profile when exposed during low water levels/draw down events.
    c. Vary the underwater profile around the reservoir for landscape and biodiversity benefits.
3. Consider the following for islands and peninsulas:
    a. Design islands in the main body of the reservoir to break up the scale and perceived expanse of water surface.
    b. Include islands and/or vegetated peninsulas in the design to increase biodiversity habitat options within wetland areas or in the main surface area.
    c. Use islands as part of erosion and wave management.
    d. Design sheltered vegetated bays to accommodate active water-based infrastructure, in landscapes where active recreation is proposed.