Built Environment Connective

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Scottish Government
Infrastructure Strategy 2027-2037

Consultation response: Built Environment Connective

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The Built Environment Connective is a diverse community of individuals and organisations representing the whole of the built environment, with five mission-focused and connected communities for clients, investors, consultants, academia and systems specialists.

The Connective's vision is for a built environment that enables people and nature to flourish together for generations. Its purpose is to achieve this by working to unlock the power of systems thinking:

- Connecting system thinkers across government, industry, academia and civil society – the stakeholders and action-takers. Community.
- Co-creating the shared understanding and common language essential for meaningful dialogue. Consensus.
- Focusing on tangible and practical actions to drive positive systems change. Change.

The Connective is currently progressing three workstreams with support from the National Infrastructure and Service Transformation Authority (HM Treasury), the Infrastructure Client Group and the Green Construction Board:

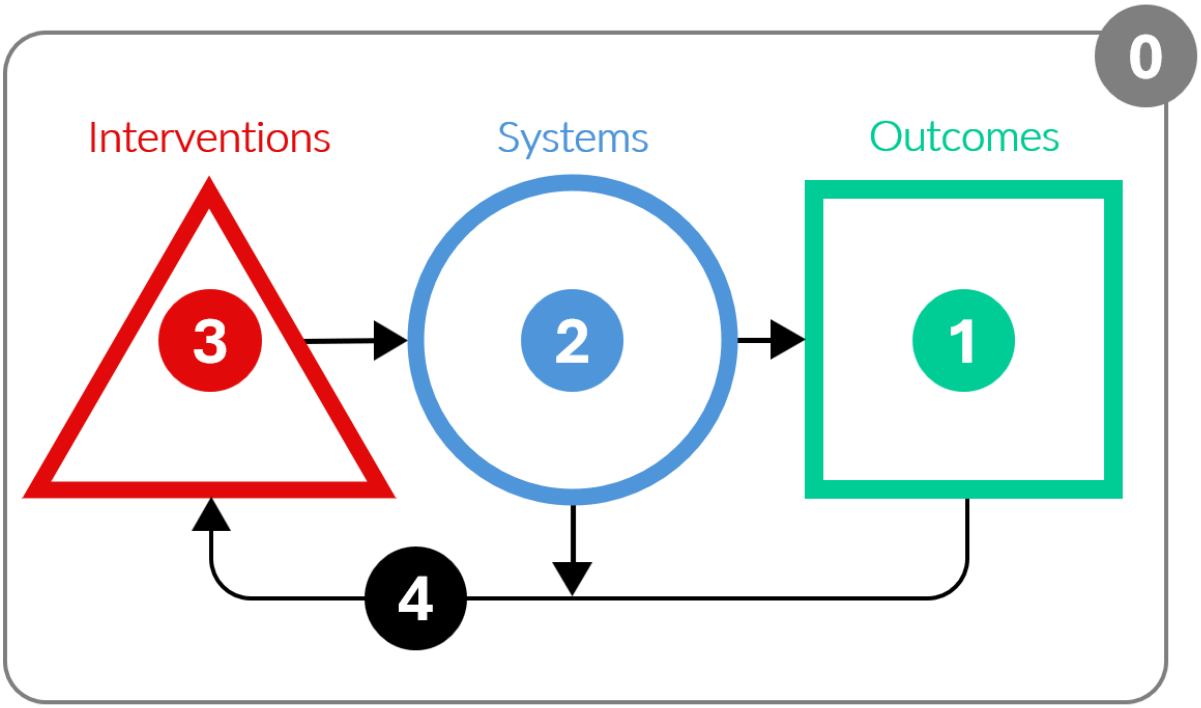
- The Built Environment Systems Review – to establish the economic case for a systems approach to developing and operating economic and social infrastructure.
- Metrics – to establish mechanisms for assessing the performance and value of economic and social infrastructure
- Competencies – to establish the skillsets required for joined-up, systemic approaches to delivery, management and optimisation of economic and social infrastructure

Guiding insights, methods and recommendations are set out in **'Connect to change'**

The Built Environment Connective welcomes the Scottish Government's long-term approach to infrastructure. Changing the performance of the built environment, to deliver better economic, social and environmental outcomes, and better value for public and private investment, requires sustained focus and effort. It also requires awareness of

connectivity, interdependency and feedback loops between different infrastructure systems.

Our response references this five-step systems change model, which can be found in **'Connect to change'**.



0 Know your scope: Start by outlining what it is that you want to influence and at which level. Understand the scope of your system of interest and the related outcomes, recognising that this is an iterative process. Draw an exploratory system boundary to help clarify what is in and what is out of scope, and who the stakeholders are.

1 Focus on the outcomes: At the highest level, desirable outcomes will be a mix of environmental, social and economic factors. Pay particular attention to understanding the gap between the desired outcomes and the actual outcomes from the existing system, because this difference will be the key driver for systems change. Outcomes are experienced by people and nature in a place, either as benefits or disbenefits. Therefore, it is essential to involve all stakeholders, giving those that are unrepresented, including nature, a voice. This is vital for identifying and agreeing the desired outcomes that a system is intended to achieve, and for making better trade-offs between different outcomes.

2 Understand the systems: Analyse the systems to understand how they can deliver the desired improvement in outcomes. Find the root causes of any issues that need to be addressed and identify potential leverage points for effective interventions. These will often be in the gaps between organisational or informational silos. Use established tools and techniques to map, model and visualise the systems. It will help to distinguish between physical, organisational and digital systems, but it is important to focus on understanding the connections between them. When mapping the systems, remember that there will be

connections that cross the boundary because systems are always parts of larger systems; no system is completely isolated from everything else. Listen to stakeholders who understand the system from different perspectives.

3 Drive effective interventions: Use interventions to nudge the systems towards delivering the desired outcomes. There are many different types of intervention, both large and small: operational interventions, maintenance interventions, and various types of construction interventions, including building new assets and modifying or removing existing ones. Within this framing, encourage initiatives to improve project delivery and construction productivity. However, the much bigger prize is to improve the performance and effectiveness of the existing built environment to achieve better outcomes, including national productivity.

4 Observe, learn and repeat: Systems thinking is an iterative process, so regular reflection and refinement are essential. Monitor and evaluate the impact of the interventions on both systems and outcomes. Develop meaningful metrics to help understand performance from end to end – from the interventions, through the systems, to the outcomes – but avoid the metrics becoming a target that replaces the actual outcomes. Pay particular attention to understanding the performance of the systems and the achievement of outcomes because these are least well measured at present. 'Value' is ultimately related to achieving the desired outcomes. Foster a culture of learning and curiosity, using evidence to drive improvement.

Question 1: Do you agree with the scope and role of the Infrastructure Strategy?

Key message: The Strategy's role should be clearer as a system-wide stewardship and decision framework.

We broadly agree with the proposed scope and role of the Infrastructure Strategy.

The proposed scope is appropriate in recognising infrastructure as economic, social and natural, and in acknowledging that Scotland's infrastructure system includes Scottish public assets as well as private, regulated and UK public infrastructure. This is important because outcomes such as net zero, environmental sustainability, prosperity, resilience, public service reform and regional equity depend on interactions across sectors, asset classes, places and governance responsibilities.

We also agree that the Strategy should provide the long-term framework rather than operate as a fixed project pipeline. Given fiscal constraints, cost inflation, maintenance pressures and changing long-term needs, it is sensible for detailed programmes and projects to be shaped through spending reviews, budgets and delivery pipelines.

However, we would strengthen how the Strategy describes its own role. It already includes important elements such as the lifecycle approach, investment hierarchy, place-based working, natural infrastructure and private investment. The opportunity is to show more clearly how these elements work together as part of a system-wide stewardship and decision framework, rather than only as components of a planning and funding framework.

In particular, we would strengthen the following:

1. The Strategy should make clearer how its high-level outcomes will guide strategic choices and trade-offs. It rightly identifies the outcomes it wants to support but could say more about how those outcomes will shape priorities across sectors, places, asset classes and types of intervention.

2. The Strategy should build on its place-based approach by making strategic interdependencies more explicit. Energy, digital connectivity, transport, housing, water, health, care, natural infrastructure and climate resilience are not separate systems in practice. The Strategy should identify the most important cross-system relationships, risks and sequencing issues that will shape infrastructure choices, especially where responsibility is shared across Scottish Government, local authorities, UK Government, regulators and private owners.

3. The Strategy should treat digital and data capability as a core strategic enabler of infrastructure planning, decision-making and system stewardship. Digital is already referenced in the Strategy but, in this context, it should mean more than broadband, telecoms or connectivity. It should also include the data, modelling, standards, digital twins, asset information systems, analytical tools and institutional capabilities required to understand Scotland's infrastructure as an interconnected system, and make decisions regarding investment in the parts and whole of that system.

4. The Strategy should ensure that natural infrastructure is treated consistently as core infrastructure in appraisal, prioritisation, asset management and long-term investment planning, recognising that to build, sustain and obtain the services we expect from economic and social infrastructure, we are ultimately reliant on nature. The Strategy already recognises its importance through cross-cutting priorities and investment mechanisms, but natural assets, blue-green infrastructure, flood protection, peatland, land, water systems and nature-based solutions should be embedded in the same decision disciplines as other infrastructure assets, where appropriate.

In summary, the Strategy contains many of the right components. The main opportunity is to show more clearly how they work together as a system-wide stewardship framework, particularly for managing interdependencies, digital and data capability, natural infrastructure, and trade-offs across sectors, places and delivery responsibilities.

We encourage the Scottish Government to consider the interdependent relationship between the built and natural environments set out in **'Our vision for the built environment'**.

Question 3: Do any elements of the infrastructure lifecycle need to be strengthened to promote more effective infrastructure planning and delivery?

Key message: The lifecycle should operate as an iterative decision-and-learning system, not only a sequence of project controls.

Yes. While the Strategy already identifies many of the right lifecycle elements, including the investment hierarchy, we would strengthen how these components are applied together as an integrated decision-making and learning system. In particular, lifecycle governance should help ensure that infrastructure choices remain outcome-led, system-aware and focused on long-term public value.

We would focus on the following areas:

1. Although the Strategy addresses funding, deliverability and private investment, it could more clearly set out the principles and decision framework for assessing funding, financing, ownership, risk allocation and delivery models. This would help ensure that such choices are guided by long-term public value, system performance, affordability and appropriate risk allocation, rather than primarily by the availability of capital.

2. Digital and data capability should be embedded more explicitly across the lifecycle. Digital is referenced in the Strategy, but mainly through digital platforms, connectivity, private infrastructure or innovation. It should also be treated as an enabling layer for planning, prioritisation, delivery, operation, maintenance and evaluation, including asset data, shared standards, modelling, digital twins and evidence on system interdependencies.

3. The Strategy already includes evaluation and learning, but this should become a stronger feedback loop for future planning and prioritisation. It should be clearer how evaluation feeds back into future planning, prioritisation, business case development and funding decisions. Evaluation should assess not only delivery against time and budget, but whether intended outcomes were achieved, assumptions were correct, unintended consequences emerged, and lessons were shared across sectors, places and delivery bodies.

In summary, all the major components that should be considered across the lifecycle of infrastructure appear to be present. The question is how consistently those components are applied and connected. A stronger and more joined-up approach to the lifecycle of infrastructure should help Scotland move from a project-by-project approach towards

iterative decision-making that learns from past decisions and interventions, taking account of feedback loops, contextual change and emergent conditions: using digital and data capability to understand interdependencies, distinguishing clearly between funding and delivery choices, evaluating whether outcomes were achieved, and feeding learning back into future planning and prioritisation.

Building on the lifecycle approach already recognised in the Strategy, Scotland should also ensure that the end-to-end lifecycle view is held impartially and in the public interest. Different organisations will naturally focus on different phases, but sufficient lifecycle stewardship is needed to identify systemic gaps, manage dependencies between phases, and ensure that decisions made at one stage do not create avoidable costs, risks or constraints later. This stewardship function or process should be sufficiently independent and transparent to challenge assumptions, test trade-offs and advise on long-term public value, without being captured by any particular sector, project, technology, funding model or vested interest.

Question 5: Do you agree that enabling net zero and environmental sustainability, driving economic growth, and building resilient places continue to be the right outcomes to guide infrastructure investment over the next decade?

Key message: The outcome framing should be refocused from growth to long-term prosperity, wellbeing and public value; net zero and environmental sustainability should be understood in a global, whole-system context, as well as at a granular scale.

We agree that enabling net zero, pursuing environmental sustainability and building resilient places should continue to guide infrastructure investment over the next decade. However, they should be viewed as interdependent – they have to be pursued together to achieve success. And we would strengthen the framing in two respects.

First, net zero and environmental sustainability should be understood in a global and whole-system context. The underlying outcome has not been achieved if Scotland reduces territorial emissions but shifts carbon, resource extraction, pollution or environmental harm elsewhere through imported materials, supply chains or displaced production, or if it offsets emissions through schemes outside its territorial borders. Infrastructure investment should consider whole-life and whole value chain emissions and environmental impacts, encompassing those arising from construction and operation, taking account of supplier and consumer/user emissions and impacts, which may often be beyond Scotland's borders.

Second, we challenge the framing the third outcome primarily around economic growth, even if qualified as inclusive. The Strategy rightly recognises public value, whole-life considerations and the need to make better use of existing assets. However, growth would be better framed as long-term prosperity, wellbeing and public value. Economic growth

can be an important contributor to that, but it should be treated as a means rather than an end in its own right.

We would therefore suggest reframing the three outcomes as:

1. Enabling net zero and environmental sustainability in a global, whole-system context
2. Supporting long-term prosperity, wellbeing and public value
3. Building resilient, inclusive and sustainable places

In this framing, economic growth is not ignored but placed in context. The aim should be to support the kind of economic activity that contributes to Scotland's long-term prosperity, resilience and wellbeing, while ensuring that environmental progress is genuine rather than achieved by displacing emissions, costs or environmental harms elsewhere.

It should be noted that the priorities are interdependent. The generation of capital is essential for enabling investment in decarbonisation, resilience and environmental sustainability. Equally, prosperity and wellbeing cannot be sustained without curbing emissions and protecting society from adverse impacts, including those arising from our changing climate and environmental degradation.

Question 6: Are the three proposed enablers, public assets, place-making and private investment, sufficient to deliver the Strategy's outcomes? Are there other enablers we should consider instead/additionally?

Key message: Strategy must be guided by clearly defined and shared target outcomes. The key enablers must be underpinned by clear, stable policy; effective governance and regulation; commitment transcending political cycles.

We agree that the proposed enablers are correct but note:

- **Public assets:** It is estimated that new construction adds just 0.5% by value, annually, to the built environment overall. The extent and inclusiveness, quality and effectiveness of services provided by economic and social infrastructure therefore relies principally on managing and optimising assets that already exist. This requires proper attention to maintenance and repair, in turn requiring realistic, prioritised investment. Asset management involves more than good maintenance, however. Strategic investment in renewals, enhancements and extensions of existing assets, and in augmenting the performance of the built environment with new assets is required. Paradoxically, the delivery and commissioning of many new assets impairs the performance of existing assets with which they interface. Close attention must therefore be given to systems engineering and integration.
- **Place-making:** Places, communities and infrastructure are inseparable. The extent, performance and effectiveness of infrastructure fundamentally affect the quality of

places and the extent to which places can flourish. It is important to recognise that nature is itself a form of infrastructure, providing "services" that are essential to economic and social prosperity and wellbeing – clean water and air, flood protection, pollination, fertile soil, resources for industry. The Strategy should consider the built and natural environments together, taking account of impacts and feedback loops, and recognising uncertainty in how they may manifest, or over what timescales. The strategic approach to place-making must take care to hear representation from all parts of affected communities, including nature.

- **Private investment:** The Strategy should consider innovative approaches to attracting private investment including: blended funding, with public money used to de-risk the early stages of project delivery; increased use of the regulated asset base model, providing investors with predictable return on capital; user charging to create new, additional funding for essential maintenance.

These three enablers themselves require enablement in the form of clear, stable policy; effective governance and regulation; commitment transcending political cycles. Without these, investors, communities and the infrastructure supply chain will not "go on the journey with you". Gearing up to achieve a step change in the way infrastructure is managed and delivered requires suppliers to gear up – training and recruiting staff and purchasing equipment; investors to commit funding; and communities to engage and develop trust.

It is essential for there to be clearly defined and agreed outcomes for all key stakeholders, including communities and nature: an understanding of the outcomes that are delivered by infrastructure in its present condition, and what outcomes are desirable in future. Clear and practical metrics are needed to capture, report and track performance.

We note that the 'infrastructure industry', comprising owners, consultants, contractors, suppliers, trade associations, professional institutions, lobbyists and special interest groups, is fragmented and parochial. We anticipate that responses to this question will elicit responses reflecting priorities as individual organisations see them – with strong sector, service and local biases; few if any organisation is equipped to give a rounded view.

We offer the change model, illustrated at the start of our response, as a means of methodically examining strategic requirements. It starts with making an informed decision on where the boundary of a "system of interest" should be drawn – what to include and what to exclude. The boundary should be iteratively redrawn, based on observation of outcomes arising from interventions, and continuous learning.

Question 7: What mechanisms or approaches should the Infrastructure Strategy adopt to ensure that critical cross-cutting priorities, such as housing delivery, regional economic development, and natural infrastructure are systematically embedded in investment planning and decision making?

Key message: The Government should start by determining specific target outcomes for people, places, the economy and nature. This will improve the Government's ability to determine the mix of activities that is needed, and guide investment.

We again offer the change model as an effective mechanism for achieving this objective. It can be applied to any system at any scale, to map the relationships between outcomes, systems, and decision-making that leads to investment in "interventions".

This order – outcomes > systems > interventions – is important. First asking "what do we want to achieve, for whom, why and by when" opens up examination of the gap between those desired outcomes and the outcomes currently achieved. What systems are delivering those outcomes, how? Exploring those questions enables the identification of interventions (requiring investment) that will modify system behaviour, to deliver different outcomes. The model can be used to examine different scenarios, explore and refine master plans, set priorities and rationalise decision-making. It provides the means to accurately define the scope of interventions and achieve a more predictable cost.

It is essential to monitor and measure the outcomes that actually materialise following interventions, and check them against desired outcomes. As recent major schemes have illustrated, the rationale for initiating infrastructure projects is often surprisingly unclear. Even when it is clear, projects rarely perform exactly as expected, and their impacts on other infrastructure systems is seldom taken into account. Paying attention to actual outcomes enables learning and iterative progress, through further carefully targeted interventions, towards the intended outcomes.

Question 9: Do you support the proposal that infrastructure investment is more directly driven by the priorities of places across Scotland?

Key message: An effective mechanism is required for determining place-based needs and priorities, and enabling collaborative approaches to shared challenges.

Yes, we firmly support this proposal. Outcomes are experienced by people and nature in a place, either as benefits or disbenefits. Therefore, it is essential to involve all stakeholders, giving those that are unrepresented, including nature, a voice. This is vital for identifying and agreeing the desired outcomes that infrastructure is intended to achieve, and for making better trade-offs between different outcomes.

When infrastructure investment is not driven by the priorities of places, the outcomes are suboptimal for the economy, people and nature. In many instances it can be disastrous, resulting in:

- degradation of existing economic, social natural systems, and consequent loss of services and value
- increased social and economic inequality, erosion of trust and dysfunctional relationships between Government and communities
- reduced resilience
- eroded "license to operate" and political capital

- overall poor value for money

The cost of community engagement, consultation and communication should be recognised as an investment that pays dividends through improved mutual understanding between communities and Government, more realistic investment decisions, more cooperative planning and delivery, and greater project certainty. Moreover, it is essential that communities, organisations/sectors and Government adopt a better-coordinated, place-based approach to resolve many of their common challenges, including decarbonisation, flood protection, adaptation to the impacts of climate change, water scarcity, energy and data security, nature recovery and pollution control. It is increasingly recognised that such challenges cannot be resolved by organisations acting in isolation. They can only be tackled effectively by taking a collaborative, place-based approach.

We again refer the Government to the change model as an effective means towards understanding the link between infrastructure investment and outcomes.

Question 10: Are the proposed principles, national spatial priorities and place partnerships, the right ones to guide a place-based approach? Are there other principles we should consider?

Key message: Implementing the principles, priorities and partnerships set out in this Consultation will require practical and effective approaches.

We agreed that the principles, priorities and partnerships set out are fundamentally right, although we would like to see nature clearly recognised as an essential component in national, regional and local strategy: nature needs to be assigned equivalence to infrastructure to attain long-term social and economic prosperity and wellbeing.

The proof of the principles, priorities and partnerships set out in the Strategy will be in implementation.

We are encouraged that the Government has identified examples of successful implementation – we're familiar with FUTURES methodology that has been used with positive effect in New Zealand and elsewhere, to engage with and consult communities, and collaboratively evolve solutions for major infrastructure projects. And we encourage the Government to explore the increasingly broad and effective suite of systems mapping, modelling and decision-support methodologies that are now available.

The principles, priorities and partnerships outlined in the consultation represent a large and complex system: infrastructure in all its forms, and the services it provides for people, the economy and nature, from national to local scale.

We note that the change model can be applied at any scale. It provides a useful and accessible lens for examining systems and outcomes, and for determining where investment in interventions can have the greatest effect.

Question 13: Are there additional sectors or opportunities that should be considered for strategic investment to support economic growth and maximise opportunities for longer-term growth?

Key message: Strategic investment should focus on enabling capabilities, not simply additional sectors.

Yes, although we would frame the purpose as supporting long-term prosperity, resilience and public value, rather than economic growth alone.

Many of the obvious strategic sectors and opportunities are already recognised in the Strategy, including renewables, housing, natural capital, ports, place-based regeneration, active travel and aspects of the circular economy. Rather than adding a long list of further "growth sectors", the greater opportunity is to invest in the enabling capabilities that allow these sectors to deliver long-term prosperity, resilience and public value.

We would highlight the following areas in particular:

1. Building on the Strategy's references to digital connectivity, digital infrastructure and innovation, digital, data and cyber-resilient infrastructure intelligence should be treated as a strategic opportunity in its own right. This includes shared data standards, asset information systems, geospatial capability, modelling, digital twins, cyber resilience and analytical tools. These capabilities are essential for understanding infrastructure interdependencies, improving asset performance, managing risk, increasing productivity and making better decisions across sectors and across the whole lifecycle.

2. Building on the Strategy's focus on renewables, grid and storage, energy flexibility and smart local energy systems could be developed more explicitly as a strategic opportunity. Scotland's renewable energy potential will only translate into long-term prosperity if clean energy can be stored, managed and used effectively across places and sectors. This includes demand response, heat flexibility, EV charging integration, data-enabled grid management and community energy. The opportunity is not only to generate renewable power, but to create a flexible, resilient and locally valuable energy system.

3. Third, systems integration, lifecycle stewardship and delivery capability should be recognised as a strategic capability area. Scotland will need people and organisations capable of integrating infrastructure, finance, digital, natural capital, planning, communities and delivery across the lifecycle of assets and systems. This includes public-sector client capability, portfolio orchestration, systems engineering, programme integration, commercial capability, cross-sector convening and learning. It should also include the skills, supply chains, maintenance productivity, materials reuse and delivery capacity needed to make better use of

existing assets. Without these capabilities, investment may continue to be fragmented, even where individual sectors are well identified.

In summary, the priority should be less about adding further sectors and more about strengthening the enabling capabilities that allow already-recognised sectors to deliver better outcomes. On that basis, the most important additional opportunities are digital and data infrastructure intelligence, energy flexibility and smart local energy systems, and systems integration, lifecycle stewardship and delivery capability.

Question 14: To make the most of the strategic opportunities in renewables, housing, and natural capital, what will the economy need from our infrastructure to grow and thrive up to 2037?

Key message: Renewables, housing and natural capital should be made mutually reinforcing through connective capacity, shared intelligence, outcome metrics, impartial challenge and lifecycle discipline. Interdependencies with other sectors and systems must be understood and managed.

To make the most of the strategic opportunities in renewables, housing and natural capital, Scotland's economy will need infrastructure that supports long-term prosperity, resilience, decarbonisation, nature recovery, social wellbeing and public value. Assets and systems must themselves be resilient, efficient and effective – to deliver the services required.

The Strategy already recognises many of the relevant enabling requirements, including private infrastructure, energy networks, housing-related infrastructure, natural infrastructure, place-based working, funding models and lifecycle planning. The key issue is not simply to add more infrastructure categories, but to strengthen the connective capacity that allows renewables, housing and natural capital to reinforce each other.

1. Scotland will need focused cross-sector mechanisms to address practical delivery challenges in renewables, housing and natural capital. The Strategy already recognises collaboration and place-based partnerships, but there would be value in going further by supporting more targeted communities of action around barriers such as grid constraints, housing infrastructure coordination, retrofit delivery, natural capital governance, community value capture and the alignment of public and private investment. These should be practical delivery-oriented forums that diagnose systemic barriers, identify pathways, test solutions and share learning, rather than general discussion forums.
2. Scotland will also need stronger digital and data capability as an integration layer. The Strategy already references digital connectivity, private digital infrastructure, digital platforms and innovation, but to make renewables, housing and natural capital work together, Scotland will also need shared data standards, asset information, geospatial capability, digital twins, natural capital evidence, whole-life

carbon assessment and learning platforms. The Strategy should recognise these capabilities as strategic enablers of cross-sector planning, prioritisation and outcome tracking.

3. Scotland will need more specific outcome measures that connect renewables, housing and natural capital to public value. The Strategy already recognises benefits, outcomes and social value. Building on this, assessment of these strategic opportunities should give sufficient weight to long-term public value, including carbon reduction, biodiversity, resilience, affordability, access, productivity, health, wellbeing, inclusion, local value and fiscal sustainability. The Strategy should make clear that these broader outcomes will shape how strategic opportunities are prioritised and evaluated.

4. There would be value in clearer impartial whole-system oversight and policy challenge. The Strategy already sets out governance principles and place-based working, but renewables, housing and natural capital cut across sectors, places, regulators, investors and communities. A clear function or process should be able to test whether policies, investment decisions and delivery models are mutually reinforcing and aligned with long-term public value. It should also help guard against decisions being unduly shaped by any particular sector, project, technology, funding model or vested interest.

In summary, the economy will need more than investment in renewables, housing and natural capital as separate opportunities. It will need connective capacity, shared intelligence, specific outcome measures, impartial challenge and consistent lifecycle discipline to make those opportunities reinforce each other and create durable public value.