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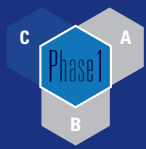
Phase 1

B

Infrastructure
Commission
for Scotland 

Part C

Cross Cutting Recommendations



Part C: Cross Cutting Recommendations (continued)

Introduction

Having placed an inclusive net zero carbon economy at the core of its thirty-year vision, the Commission does not underestimate the nature and scale of the challenges as well as the opportunities that this presents to Scotland. Whilst the journey to this vision has already started, the urgency and pace of change will need to increase, and the scale of change required will affect almost every aspect of daily lives. It is also becoming clear that the vision of an inclusive net zero carbon economy will sometimes require difficult choices to be made and trade-offs to be addressed. Therefore, if we are to be successful in capturing the opportunities whilst facing up to the challenges, it is not a matter of choosing change or no change; it is a matter of what, how and when future change will happen and the choices we make to get there. Informed, enhanced and inclusive engagement with users and citizens throughout that process of change will be critical.

These changes and choices clearly go far beyond infrastructure. However, infrastructure is and can continue to be a key enabler of, and contributor to, wider change. In relation to long term infrastructure investment and prioritisation, the ability to demonstrate the contribution these choices will make, to achieving the desired inclusive net zero carbon economy outcomes, will be essential. Building on the excellent start made through the National Performance Framework, “measures of success” for an inclusive net zero carbon economy from infrastructure investment urgently need to be established. The work of the Commission has also highlighted the need, in both the public and private sectors, for a transition to a system wide approach to infrastructure strategy, planning, delivery and operation across all infrastructure sectors supported by a coherent place-based approach to planning and decision making. Building on the work presented in Parts A and B, we have developed a series of recommendations for Ministers to consider.

01

Key Recommendation
Leadership

To provide leadership and demonstrate intent, the Scottish Government should prioritise all new infrastructure investment decisions based on their contribution to the delivery of an inclusive net zero carbon economy.

Infrastructure investment has an important role to play in delivering the aim of an inclusive net zero carbon economy. However, it is not simply a case of determining the demands for infrastructure and developing an assessment of infrastructure investment to achieve those demands.

As the OECD indicated

“While the size of an infrastructure gap commands attention to the challenges of infrastructure planning, an infrastructure gap as traditionally considered, principally reflects the scale of the latent investment demand, and it does not distinguish between productive and wasted investment or relate to what outcomes countries would like to accomplish through infrastructure provision”

The OECD has also suggested that...

“the historic approach of “predict and provide” infrastructure planning is now obsolete, as most countries have stopped focusing solely on rapidly rising consistent levels of economic growth in the face of new outcome-based challenges”

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Key Recommendations

Leadership



The OECD also indicated that a key challenge to infrastructure planning is now the need to incorporate different demand and supply-side considerations into the decision-making framework including demand management measures.

A refreshed Infrastructure Investment Plan – that in particular sets out the infrastructure investment priorities over the next 5 years - is due to be published by the Scottish Government during 2020. Much of the preparatory work is already underway across Government, and it is very encouraging to note from our discussions with Scottish Government officials that the priorities for investment are to be focused on the delivery of inclusive economic growth and net zero carbon outcomes, reflecting the broad principles set out above by the OECD. Place is also viewed as a key consideration for investment, and as identified in Part A of this report the Commission also view Place based approaches to investment to be a key component of effective investment prioritisation and planning.

Whilst robust evidence and assessment frameworks are in place, including some work recently developed by the Scottish Government's Scottish Centre for Regional Inclusive Growth, there is still work to be

done in the applicability of tools and in particular in relation to infrastructure investment. This is not a uniquely Scottish challenge; the Fraser of Allander research commissioned by the the Commission re-affirmed the progress made in Scotland and elsewhere, but also highlighted the need for further development, as well as the the challenges involved. This situation does contrast slightly with the position in relation to Net Zero Carbon. Whilst achievement of net zero carbon by 2045 will clearly be extremely challenging, measuring the progress being made and demonstrating the reduction in CO2 emissions by specific investment interventions and programmes is, at this stage, better understood. In order for future long terms investment decisions and priorities to be informed from an evidence based perspective, and to enable the relative trade offs required to achieving the desired outcomes, it is the view of the Commission that a long term, over-arching assessment framework and methodology across all infrastructure asset types, does still need to be developed. The establishment of a fully developed assessment framework and methodology that is focused on contributing to inclusive growth and



Scottish Government committed to increasing infrastructure investment by £1.5 bn per year higher by 2025-26 than in 2019-20 (the National Infrastructure Mission)

This will require additional investment of over £1 billion per year over and above the existing plans set out in the Five-Year Financial Strategy

net zero carbon outcomes will be an important component to inform the basis of future infrastructure investment plans and priorities. Successfully achieving this will be essential to enable system wide, long-term trade offs and choices across the range of outcomes to be made. This framework will need to be established in advance of the development of the next update to the Infrastructure Investment Plan beyond 2020.

To support this ongoing development, the Commission also considers it beneficial for a long term infrastructure needs assessment to be completed. This would be undertaken in parallel with the establishment of the assessment framework, and incorporate the output of a number of additional recommendations made by the Commission. This work would help to underpin a detailed understanding of need across the entire infrastructure system and also establish greater clarity in relation to the key interdependencies, constraints and requirements.

It is though recognised by the Commission, that investment priorities need to be established in the immediate short term as part of the 2020 Infrastructure Investment Plan, in advance of this further development of any assessment framework. These immediate short term investment decisions should be based on the most appropriate methodology available that prioritises, on a “no regrets” basis, the contribution to an inclusive net zero carbon economy.

On this basis it is recommended that:

1. **All Scottish Government funded projects included in its 2020 Infrastructure Investment Plan should be prioritised against available inclusive net zero carbon economy outcomes.**
2. **The Scottish Government should, by 2021, develop and publish a new infrastructure assessment framework and methodology that will enable system wide infrastructure investment decisions to be prioritised on the basis of their contribution to inclusive net zero carbon economy outcomes.**
3. **The Scottish Government should publish by 2023 a system wide Scottish Infrastructure Needs Assessment covering all infrastructure sectors defined by the Scottish Government and we recommend the inclusion of natural infrastructure. The Assessment should be refreshed and updated at least every 5 years thereafter.**
4. **A fully updated Infrastructure Investment Plan should be developed by the Scottish Government for publication by 2025 using the new assessment framework and methodology and informed by the Infrastructure Needs Assessment.**

02

Key Recommendation
Place

To achieve an inclusive net zero carbon economy, the Scottish Government should put “place” at the heart of coherent, infrastructure prioritisation and planning.

“Place is where people, location and resources combine to create a sense of identity and purpose and is at the heart of addressing the needs and realising the full potential of communities. Places are shaped by the way resources, services and assets are directed and used by the people who live in and invest in them”

The Place Principle

This Place Principle was agreed between Scottish Government and COSLA in February 2018, and seeks to embed a more joined-up and collaborative approach to services, land and buildings within a place, to achieve better outcomes - one size does not fit all. Within this picture of Scotland's places, the spatial levels for decision-making are clearly important and can be seen to have developed in recent years. Place-based interventions have often been developed at a local level i.e.



community or town level and are supported by considerable legislation as identified in Part A of this report. Local authorities are central to the implementation of this with a range of resources and mechanisms at their disposal, including their role as the local planning authority. In driving local policy and investment decision-making for better places, they therefore have a strong co-ordination and partnership role.

Spatial decision-making is further built up through regionalisation developments. Building on the establishment of City Region and Growth Deals there is an increased regional focus that has brought together groups of authorities and their partners to understand and plan regional priorities. While these strategic partnerships are in their infancy for many, they are following a different strategic planning approach, that encompasses not only issues previously covered by strategic development plans, but wider economic, social and environmental shared priorities. Place-making is often explicitly referenced as important by these partners, as well as being implicit in activities. Reflecting this increased focus on the region, the Planning (Scotland) Act 2019 has introduced a requirement for all authorities to develop regional spatial strategies. In addition, through national bodies, including Transport Scotland, Scottish Enterprise and Scottish Futures Trust, it is recognised that infrastructure investments can significantly impact on the quality of places and the priorities of local people.

Place therefore is an increasingly referenced policy area, with implications at different interlinked spatial levels. Decision-making that has a role in place-making is taken at a national, regional and local level. During our engagement activities, stakeholders who were aware of tools such as the Place Standard believed they provided a strong resource for local decision making, however also suggested place-making was not sufficiently embedded in practice. Appropriate co-ordination of all partners' activities was also a theme, to ensure the different spatial priorities are blended to create places that most meet residents' expectations. Trade-offs and best-fit of priorities across areas needs to be considered.

The recently published guidance on the National Planning Framework 4 by Scottish Government also identifies Place as a critical component of how this Framework will be developed.

Early engagement by Scottish Government also identifies Place as a critical component of how this Framework will be developed.



In our engagement, a number of essential elements of place have emerged that contribute to a successful vision of an inclusive net zero carbon economy, that in combination need to be further developed to tackle both the challenges of achieving this vision as well as seeking to exploit the opportunities. This manifests itself in relation to labour supply and markets and the benefits of developing a coherent long-term approach to housing demand and supply, as well as the desire to ensure that the economic and employment opportunities can be fully capitalised upon.

Housing has been highlighted by a range of stakeholders as a key driver and enabler of inclusion, from both a spatial and affordability context. Scottish Government are currently in the midst of their Housing 2040 Consultation which is due to report during 2021, and are seeking to better understand and address these issues. One of the fundamental aspects that has been highlighted to the Commission by a range of stakeholders is the need for a clear long term, coherent national housing needs and demand assessment to be completed. It is acknowledged that a Housing Needs and Demand Assessment (HNDA) is periodically completed by local authorities, however stakeholders considered that the approach would benefit from greater coherence at a regional and national level. A revised approach was also seen as vital to assess the implications of the current demographic forecasts,

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Key Recommendations

Place

both in terms of geographic and age based trends that have been identified from the evidence provided to the Commission.

Enabling and supporting infrastructure is also considered by a range of stakeholders as an important component to successful housing and commercial property development across Scotland, and is often referred to as the principle of an Infrastructure First approach to development planning and implementation. Local and strategic planners, infrastructure providers (both private utilities and public asset owners) and many house developers that the commission engaged with, all identified a need to address the systemic challenges currently faced. In a situation where inclusion and net zero carbon are also going to figure highly in future infrastructure development, design and implementation, the need to create a coherent approach is even more crucial.

The Independent Planning Review set out the potential benefits of strengthening such an Infrastructure First approach, which has been built upon most recently through the Scottish Land Commission and Scottish Futures Trust report which set out a potential approach to implement this in the context of land value capture. Most recently,

research undertaken for Scottish Government in relation to the ongoing development for NPF4 has recommended that an Infrastructure First approach be adopted, which the Commission supports. This coherent place based approach to development planning and investment across all of Scotland should include:

- > a strategic national perspective in the first instance, for all tenure housing supply and demand, driven by, in particular, demographic and inclusive net zero carbon economic trends over the long term;
- > assessment of existing and currently planned infrastructure investment that could impact on this strategic housing demand profile through effective utilisation of existing assets;
- > an across Scotland integrated and effectively co-ordinated Infrastructure First approach to development planning and investment; and
- > integrated with a place based assessment at a local, regional and national level that considers key labour market and supply opportunities from an inclusive net zero carbon economy.

It is anticipated that such a coherent and iterative process would promote greater infrastructure planning coherence across spatial geographies and also assist in identifying the potential economic and business opportunities from an inclusive net zero carbon economy.

On this basis it is recommended that:

5. **The Scottish Government should lead the development of a place based assessment of long term housing supply and demand across Scotland by 2021, supported by the development of a coherent strategy for the labour market and business opportunities arising from an inclusive net zero carbon economy.**
6. **To support the implementation of National Planning Framework 4, and the new system of development plans a co-ordinated and appropriately resourced Infrastructure First approach to the planning system should be introduced by the Scottish Government by 2021. This should be undertaken with infrastructure providers, developers and other public bodies, to ensure the effective delivery of a Scotland wide, integrated and coherent outcome based approach to planning spatial land use; with implementation to be undertaken at the appropriate regional, local and community level.**





Rethinking spatial land use and
planning as a whole

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Key Recommendation

Making the most of existing assets



Most of the underlying infrastructure that will be used in 30-years time already exists today. It is therefore essential that these assets are most effectively and efficiently utilised, maintained and enhanced to net zero readiness.

Infrastructure

With around 150 separate bodies delivering a wide and diverse range of services across Scotland, the emerging picture of the supporting infrastructure required across Scotland is one of a large, complex and diverse landscape. Even when only considering schools, health, police, fire and rescues and prisons, between them, their estate extends to nearly 3,700 physical assets, with the majority serving only a single purpose. This would suggest a sector led and somewhat fragmented approach to investment decision making and raises questions about whether we are getting the most effective infrastructure solutions delivered in the most cost-efficient way. A more strategic and cross-cutting approach to planning and investing in both existing and new infrastructure would help to address this. There needs to be a greater focus on the benefits of sharing resources and assets and being more open to opportunities to ensure the most effective use of the assets already at our disposal.

It is important to ensure that adequate resources are available to enable full and proper maintenance of assets. It is all too easy to fail to provide properly for maintenance, especially when there is significant pressure on resource budgets. However, to do so is a false economy and a major challenge facing our public services is to ensure proper maintenance regimes are developed and implemented.

Full and proper maintenance will not only ensure assets perform more effectively during their lifetime but infrastructure assets that have been well maintained are potentially easier to repurpose, adapt and refurbish when needs and requirements change. Rebuilding is not always the best option.

There is a broad range of evidence from stakeholders and contributors to the work of the Commission that highlights the requirements to make the most of existing assets. This has been highlighted in Part B in relation to the majority of the sectors being considered by the Commission.

In order to illustrate this in terms of overall infrastructure investment and prioritisation, the following hierarchy can provide a useful framework within which to consider the context of this:

- > assess the future demand and requirement of services to determine the overall infrastructure needs in a place, within the context of an inclusive net zero carbon economy;
- > assess the capacity and suitability of existing assets to meet those needs, including consideration of place based collaborative opportunities;
- > determine if assets are fit for purpose and what adaptation or repurposing is required;
- > assess the viability and sustainability of action required; and then
- > consider what assets need to be replaced

It is clear from this hierarchy that there may well be circumstances where replacement assets are a requirement. However, designers and decision makers should consider this in the context of what is required and whether or not existing assets can be adapted or repurposed. Across a portfolio, it will also be necessary to consider additional functionality or capacity through investment in existing infrastructure resilience.

On this basis it is recommended that:

7. **By the end of 2020, the Scottish Government should require all public sector infrastructure owners to develop asset management strategies containing a presumption in favour of enhancing, re-purposing or maintaining existing infrastructure over developing options for new infrastructure. New infrastructure should only be considered where the relevant authority has demonstrated this is the most appropriate response.**
8. **To support this, the Scottish Government should now prepare guidance for relevant authorities on a whole-life approach to infrastructure maintenance and prioritisation which includes both cost and build resources. It should also include guidance on assessing the wider net zero carbon and inclusive economic growth priorities that need to be established.**
9. **There should also be a presumption against like-for-like replacement of existing assets and the construction of new, single organisation/purpose assets in favour of shared facilities.**



2.5m tonnes

total amount of household waste generated in Scotland each year



1 tonne

of approximate waste disposed by each household in Scotland

Resources

There is a recognition that the non-sustainable use of natural resources, alongside air, soil and water pollution from increased use of our natural and manufactured resources are now at a critical stage. These activities are also major contributors to the climate emergency. At a roundtable event hosted by the Commission a number of key factors were identified:

- > The waste collection, recycling and repurposing system is complex and fragmented with limited knowledge and capability to establish what resources are available at scale.
- > The current system is not geared towards, nor explicitly designed around, the resource opportunities from the reprocessing of recycled waste
- > Incentive mechanisms are not currently aligned, nor is the market organised at the appropriate scale, to stimulate investment in end to end system recycling and reprocessing facilities in Scotland.

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Making the most of existing assets



The Scottish Government is due to introduce a Deposit Return Scheme (DRS) for plastic (PET), aluminium and steel cans and glass bottles during 2021.

The opportunities to stimulate market investment in Scotland are recognised and considered to be potentially substantial, and it is hoped will be stimulated by for example the DRS Scheme currently being developed. Nevertheless, this is still in its infancy and as it currently stands, this investment has yet to be secured for reprocessing facilities associated with the DRS and addressing this was identified as a key requirement to enable the full business and inclusion benefits of the scheme to be realised. In addition, the DRS currently only deals with glass, steel and aluminium cans and PET plastics, although it has been designed so that other materials can be included at a later date. The development of opportunities for other materials to be considered in the future was viewed as essential. It was also suggested that there could be benefit in an over-arching national function, that is integrated with approaches to collection and recycling, with the purpose of stimulating and supporting waste management reprocessing projects, to generate and deliver indigenous opportunities.

Participants agreed that there is an urgent need for less complexity and greater transparency within the waste stream. It was recognised that

Zero Waste Scotland have set out a vision for Scotland, however there was also wide acknowledgement of a required increase of pace in recycling, reuse and repurposing of natural or manufactured resources. This would reduce the overall consumption of new resources; as well as to maximising economic and business potential from lifecycle management and reprocessing of resources in Scotland.

Reliable data collection, that is available to policy makers, is a priority and should not be confined to the private sector. Public bodies with data relating to waste should be expected to share it more widely so that the full benefits and requirements of a circular economy can be analysed.

Infrastructure resilience and adaptability was also a key stakeholder concern, and ranged from specifics around climate resilience and how flood management is being co-ordinated to the wider issue of how infrastructure design and investment is planned to ensure its resilience. This highlights the diversity of outcomes that resilient and adaptable infrastructure will be required to meet. It includes both the ability to respond quickly to low probability high impact events, but also the need

to design redundancy into a system to manage and mitigate the impact of events whilst they are happening. There are inevitable vulnerabilities across our infrastructure. Establishing a clear system-wide understanding of these vulnerabilities is an important component of establishing their scale. The Scottish Government's 2nd Scottish Climate Change Adaptation Programme^{lviv} identifies 7 key outcomes, including infrastructure resilience. In addition, there is a statutory UK-wide requirement for the Committee on Climate Change to prepare Climate Change Risk Assessments^{lvw} every 5-years, again including the risks to infrastructure. This is a clear step to begin to addressing vulnerabilities and increasing prevention measures to minimise potential system failures. A system-wide approach is critical to moving beyond asset specific risk management and to identifying the key systemic interdependency risks; it should also increase the potential for system-wide resilient design and planning.

On this basis it is recommended that:

10. **To support the creation of a vibrant circular economy for Scotland, by 2023 the Scottish Government should establish a route map for the implementation of a viable outcome focused system of resource use, reduction, collection, treatment and repurposing.**
11. **Drawing upon available evidence, including the 2nd Scottish Climate Change Adaptation Programme, by 2023, the Scottish Government should develop a clear implementation plan, to address critical natural and built infrastructure climate resilience and adaptation needs.**



Currently waste collection, recycling and repurposing is complex and fragmented

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Key Recommendation Heat and Transport



Key priorities for Scotland in reaching net zero carbon over the next 30-years will be accelerating the decarbonisation of heat and transport.

Decarbonisation

Transport and heat emissions combined contribute the majority of CO₂ emissions in Scotland and have therefore been a key focus for the Scottish Government in its planning to achieve a Net Zero Carbon target by 2045. The Scottish Government's current Energy Strategy has set out an action plan to address some of the key challenges to achieving this target across the wide spectrum of energy generation and consumption. As both transport and heat are devolved matters, it is vital that in these areas the Scottish Central and Local Governments, industry and civil society bodies work together to make material progress.

In relation to heat emissions a number of specific programmes and legislation have been introduced by the Scottish Government to begin to address the challenge. These include legislation to:

- > require improvements to energy efficiency to minimise the consumption of energy in existing domestic, commercial and public buildings; and
- > control the installation of domestic gas boilers to new homes from 2024.

These measures will be critical to a transition to net zero carbon. However, as a result of the 2019 increase in ambition to net zero carbon, it is recognised that more will need to be done to accelerate the pace and scale of development and implementation across all building types and owners, including incentive and support mechanisms and appropriate standards.

It is estimated that in the region of 80% of the buildings in existence today will still be in existence in 2050. Therefore, in addition to the measures outlined above, a fundamental component of reaching net zero carbon for heat is in relation to domestic buildings, as well as commercial and public sector assets. There are currently 2 million homes in Scotland with a gas boiler, and if net zero carbon is to be achieved by 2045, it is widely considered that there will need to be a transition over the next 20 years from natural gas to an alternate heat supply. The scale of the transition is significant, although it is not



Registered electric vehicles have seen an increase of over 130% in the last 12 months.

without precedent as demonstrated during the 1970's with a transition from "town" gas to natural gas. However, this time the challenge is of a far greater scale and is also considerably more complex. One of the key challenges is the likely multiple alternative solutions which include:

- > ground or air source heat pumps in individual buildings;
- > mains electricity;
- > ground, air and water source heat pumps and/or industrial waste heat connected to district heating networks;
- > natural gas/hydrogen mix;
- > full hydrogen gas (green, blue or grey, including Carbon Capture and Storage);
- > hydrogen fuel cells

Evidence that we have seen points to a potentially complex phasing of replacement heat sources with a range of solutions being introduced based on infrastructure and geographical characteristics as well as investment profile and technological advancement. There is also a matter of how best the repurposing of existing oil & gas infrastructure can be taken into consideration.

As highlighted in Part B, there are some pilot schemes in place to test a range of potential alternate technical options, but many of these are still at a very early stage of development and at a non scalable stage of innovation.

There is a similar level of scale and complexity associated with transport emissions and the transition to net zero carbon. There exists a transport hierarchy that places in order of importance of any given interventions:

- > management of demand.
- > increased use of active travel.
- > increased use of efficient public transport.
- > management of car transport.

Whilst the assessment and implementation of this hierarchy is dealt with more broadly later in this section, it is worth focusing on the current

plans in relation to road based transport and emissions. Road based CO2 emissions are the most significant contributor within the transport sector with diesel and petrol cars the most significant contributor within that. Both the UK and Scottish Governments have established legislation in relation to the reduction of CO2 emitting car vehicles setting targets for no new sales by 2035 and 2030 respectively; the presumption is currently that cars will, in the main transition to in-vehicle electric batteries. However, much work remains to be done across a range of elements including the car manufacturing industry, charging networks and technology, battery technology development, electricity generation and transmission infrastructure as well as pricing and taxation; all to be considered and managed as we transition to this alternative approach from the current dependency on petrol and diesel.



12,000

registered battery
& plug-in hybrid
vehicles in Scotland



>1,000

public charge points

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Heat and Transport

In relation to other road transport such as buses and commercial goods vehicles, there appears to be a wider range of alternatives that include in-vehicle electric batteries as well as overhead and subsurface re-charging and supply as well as hydrogen engines. As noted, all of these alternatives are at a very early stage of innovation and development and are not currently scaleable to meet the needs of operators; all of them have considerable implications for the scale, type and phasing of the supporting infrastructure that will be required.

Across both Heat and Transport, this all points to a complex set of scenarios that requires an evolving level of clarity and a system wide approach to be developed over a 30-year horizon that considers the technical, regulatory, financial, social and spatial matters. Work has begun on this through the Climate Change Committee and the Scottish Government scenario modelling, which provides an initial “no regrets” basis for investment and development. However there is an urgent need for this to be further developed and implemented to cover the areas discussed above for both Heat and Transport. It is critical therefore that this be undertaken in combination for both sectors, along with the energy generation implications, to help identify infrastructure priority investment trade-offs as well as the phasing of investment. Early engagement with UK regulators and OFGEM in particular will be an essential component of this work.

On this basis it is recommended that:

12. **By the end of 2020, and to augment legislation already being considered, the Scottish Government should set out proposals to substantially accelerate the development and implementation of incentives, support mechanisms and standards for energy efficient, net zero carbon buildings across Scotland. This should include ‘whole building’ solutions and systematic public engagement, customised to the needs of different groups, to ensure that all property owners engage with proposed changes and are committed to upgrading their property.**
13. **By 2022, the Scottish Government, local authorities, regulators and industry should work together to establish the viability, incentivisation mechanisms and a route map for the transition to net zero carbon that in combination addresses heating for domestic, commercial and public buildings as well as all surface-based transportation.**

Transport

The Scottish Government is due to publish its new National Transport Strategy (NTS) and Strategic Transport Projects Review 2 (STPR2) shortly. It is imperative that the outcomes of these processes fully reflect the shift to net zero carbon emissions by 2045 and promote inclusive economic growth and can reflect and adapt to the output of the route map recommended at 13.

The draft NTS and initial work to develop STPR2 have demonstrated a clear intent to achieve this. Therefore, the new NTS and STPR2 should follow this intent and set out how the formulation, prioritisation and implementation of transport infrastructure project choices will deliver safe, affordable, inclusive and efficient Net Zero Carbon solutions for people, goods and services.

To achieve this, the new Strategy and selected projects and programme must consider infrastructure and its use as a holistic system. Policies must promote not only the use of zero emission transport, but also new opportunities for shared mobility and on-demand services, a much greater role for public transport in the overall provision of mobility, and substantial increases in the proportion of journeys made by the active modes.

Specifically, given the urgent need to reverse the growth in carbon emissions from transport in Scotland, we recommend that the final versions of the NTS and STPR2 adopt the following principles for future transport policy in Scotland:

- > There should be a presumption in favour of investment to future proof existing road infrastructure and to make it safer, resilient and more reliable rather than increase road capacity;
- > When new/upgraded road capacity (such as bypasses) is deemed necessary it must be as part of a package of interventions that includes a broadly equal reduction in road capacity for private vehicles on the existing network;
- > Following on from the above, and to help arrest the decline in bus patronage, there should be a general programme of reallocating significant road space from private vehicles to public transport in each of Scotland’s cities and the larger towns;
- > There should be a binding national target for road traffic in Scotland derived from the requirement to achieve Net Zero Carbon by 2045, with targets set for each 5-year milestone from the 2020 baseline to 2045;



- > Existing high-capacity rail that is resilient and reliable should be more fully optimised to make the most of that capacity, in advance of new capacity being developed;
- > A national integrated fares scheme for all public transport prioritising a substantial reduction in the cost of local trips should be costed by 2022;

On this basis it is recommended that:

14. The Scottish Government should ensure that its new National Transport Strategy and Strategic Transport Projects Review 2, which are due to be published during 2020, fully reflect the need to deliver an inclusive net zero carbon economy and consider the infrastructure and use of it as a holistic system. This should include:

- **Aligning strategic investment decisions to address fully the requirement for demand management, a substantial increase in the proportion of journeys made by active travel, and opportunities for shared mobility as well as a much greater role for public transport.**
- **For such roads investment that is made as part of the above, a presumption in favour of investment to future proof existing road infrastructure and to make it safer, resilient and more reliable rather than increase road capacity.**

Scottish Transport Appraisal Guidance (STAG) is an internationally renowned appraisal framework, developed before the declaration of the climate emergency, the focus on achieving net zero carbon, and the policy shift to pursue inclusive economic growth. STAG is complemented by Transport Scotland's Investment Decision Making Guidance. In order to deliver recommendation 14 above, and build on the intent demonstrated in the draft NTS, we recommend that the existing process is redeveloped:

- > Putting the requirement to achieve net zero carbon as the unequivocal priority of the transport infrastructure project appraisal system;
- > Adopting inclusive economic growth as the standard against which to measure the economic impact of transport infrastructure projects;
- > Appraising all potential future projects on the basis of their impact on the carbon and inclusion outcomes of the overall mobility system rather than specific transport issues in isolation.

On this basis it is recommended that:

15. Investment decision making based on the above framework will require a significant change to investment guidance. Therefore, by the end of 2021, the Scottish Government and Transport Scotland should develop a new investment appraisal and decision-making process, incorporating necessary changes to the current Scottish Transport Appraisal Guidance (STAG) and Investment Decision Making Guidance.

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Heat and Transport



The nature of that infrastructure will require considerable investment over the long term, and the regime of taxation and pricing will also need to evolve to reflect the anticipated changing use of transport as well as the potential as a lever to incentivise demand management and modal shift. In light of the anticipated transition away from CO₂ emitting transport fuels over the next 10-15 years and the required infrastructure investment there is a need to consider urgently and explore alternatives to the current fuel duty regime. Building on the principles outlined above in relation to making the most of existing assets and the example of Scottish Water highlighted in Part B of this report, there is strong evidence that developing an increased certainty and transparency of investment through long term infrastructure investment regulation can be an effective approach.

On this basis it is recommended that:

16. **To enable a managed transition to an inclusive net zero carbon road infrastructure, the Scottish and UK Governments should immediately commit to establish a charging/payment regime alternative to the existing fuel and road taxation based structure. The Scottish Government should also consider additional options to provide a more stable long term investment regime for the management and maintenance of road infrastructure to meet the priorities identified in 14 above.**

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Transport is a devolved matter and therefore development of policy and investment is led by Scottish Government. As has already been identified, the scale of infrastructure change needed to encourage and support an inclusive net zero carbon economy is going to be considerable over the next 30-years

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Key Recommendation
Regulation

To incentivise investment at the necessary pace and scale to meet future infrastructure requirements for Scotland, regulation will be a critical component to the delivery of a 30-year inclusive growth net zero carbon economy vision.

As already identified in preceding sections, many of the network infrastructure assets considered by the Commission such as energy and telecoms are owned and operated by the private sector, and will require significant investment over the next 10-15 years if the outcomes of an inclusive net zero carbon economy are to be achieved. These assets are regulated at a UK or GB level by either Ofcom or Ofgem and at a devolved level for Scottish Water by the Water Industry Commission for Scotland (WICS). The Commission received strong evidence from infrastructure providers to its call for evidence and also at a specialist roundtable, which highlighted a number of key issues that needed to be addressed to enable the scale of investment to be considered. These were namely the need:

- > for a clear strategy and vision to be established to guide and steer regulatory investment for the 30-year vision;
- > to allow distribution and transmission providers to invest in anticipatory infrastructure immediately, and to enable the required increase in infrastructure capacity to be invested in and developed to meet the forecasted increases in requirements;
- > for an obligation on regulators to consider investment needed for inclusive economic growth and net zero carbon policy outcomes;
- > for cross regulator strategy and implementation plans to be developed and ideally mandated; and
- > for increased devolved regulatory requirements and implementation to ensure the specific obligation and policy aspirations can be planned for and delivered

In parallel to the work of the UK National Infrastructure Commission, the Infrastructure Commission for Scotland, has also undertaken engagement and assessment of the network utilities regulatory framework, and the outcome of our work established findings similar to those above. This additional work also highlighted that to achieve an overall inclusive net zero economy, regulatory oversight should not result in exclusive outcomes and should consider equitable outcomes and consequences for all of Scotland.

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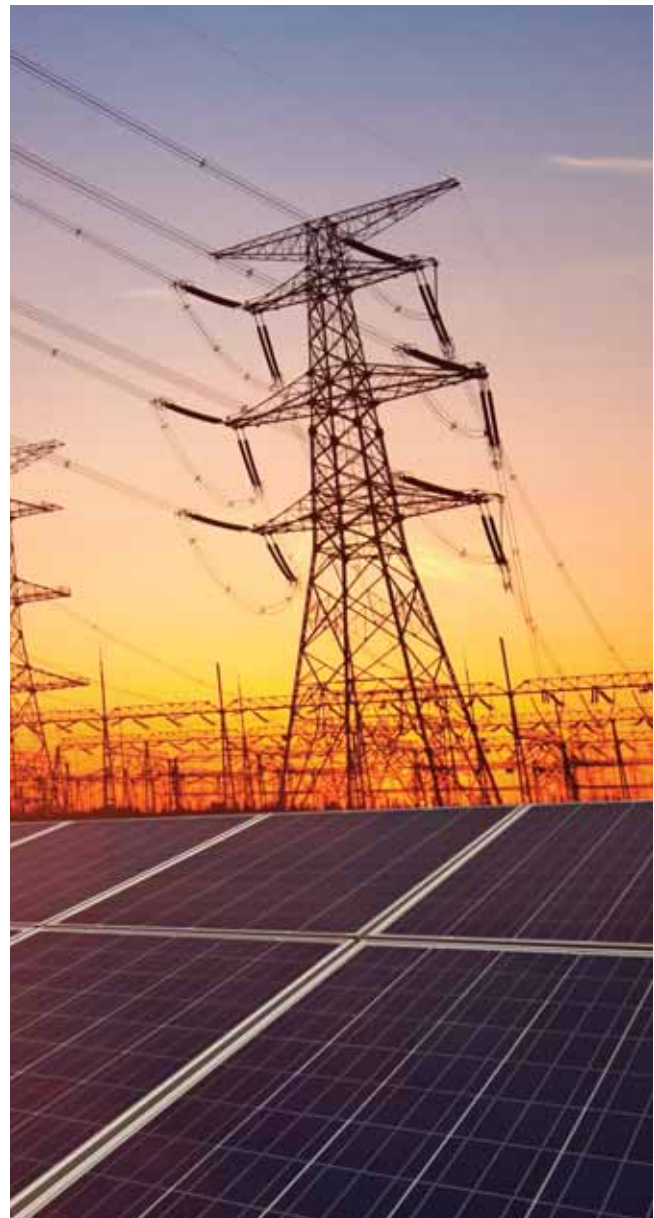
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In relation to the water regulatory framework in Scotland, it was considered through the engagement process that this was broadly delivering the required levels of investment, although the levels required over the next 10-15 years do require a considerable uplift in maintenance and renewals for Scottish Water. The issue of wider water management and investment was also considered. This does feature in the initial scoping for NPF4, and whilst long term plans have been established across Scotland, there is considered merit in seeking to establish a more coherent and less fragmented system across the various parties involved in water and flood management and resilience, from an implementation and also potentially funding perspective.

On this basis it is recommended that:

17. **Building on the findings of the recent UK National Infrastructure Commission review of Energy and Telecoms regulation, the Scottish and UK Governments should immediately commit to work together to develop by 2021, an appropriately devolved regulatory and pricing framework that enables energy and telecoms infrastructure investment to be planned and delivered to meet the future needs of Scotland.**
 18. **Building on the existing plans and the Commission's recommendation to incorporate natural infrastructure, the Scottish Government should by 2021 consider options for longer term implementation and regulatory coherence across water provision and flood management and resilience.**
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Key Recommendation Digital & technology



Ensure every citizen, organisation and business in Scotland has an ability to access digital public services, to undertake trade and commerce and to participate in future global economic markets regardless of geographic location.

The Scottish Government is committed to ensuring that

“Scotland is recognised throughout the world as a vibrant, inclusive, open and outward-looking digital nation”

This recognises the pivotal role that digital connectivity will play in contributing to the future economic growth and societal needs of Scotland. In 2011, the Scottish Government published an ambitious digital strategy charting a route extending connectivity, promoting the digital economy, digitising public services and promoting digital participation. While good progress has been made in delivering this agenda, it has only created the foundation, albeit a very solid one, from which Scotland must move forward if it is to realise its full potential in a digital world.

In addressing this challenge, the Government published a revised Digital Strategy in 2017 which set out its plans for ensuring that

“we put digital at the heart of everything we do”

The strategy recognises the complexity and scale of what this will entail and has been designed for the whole of Scotland.

A key challenge for Scotland is not only creating the right environment to deliver its current digital commitments, but also ensuring that what is put in place is sufficiently future proofed and inherently flexible enough to keep pace with new and emerging technology developments. For example, while full fibre connections will provide fast and reliable broadband and 5G will lead to improved connectivity and speed for remote access it also is a key enabler for Internet of Things (IoT) applications.

In addition, the network and systems will be installed by the digital service providers on a commercial basis. Consequently, this will need strong and consistent leadership by Government if its ambitions are to be delivered as the market will look for clarity and certainty in order to underpin its long-term investment decisions. Priority should be given to investment in full fibre fixed network infrastructure for the whole of Scotland by 2027. As this is principally a reserved matter it will require strong leadership from Scottish and UK Governments, and Ofcom, supported by the regulatory recommendations highlighted previously.

To maximise the potential from the exploitation of the advancements promised by 5G – all new public services should not only be available online but new 5G use cases for service mobility should consider starting immediately in 2020. A good example of this is health services which could be delivered at home or in the community. Social care could be revolutionised by adaptation of 5G use cases as could many other public services.

Scotland's "connectivity" with the rest of world is limited with almost all of our internet traffic transiting via London. Indeed, Scotland is the

only known European country which does not have a direct internet connection to more than one of the top 5 internet nodes in Europe (London, Amsterdam, Frankfurt, Paris & Moscow). The consequence of Scotland's data traffic travelling to and from London, means an increased delay or latency between data being sent and received.

Next generation digital services will require low latency which requires data centre capacity located close to people using the services. That data will become commercially extremely valuable. To underpin and accelerate the technical and economic transition of the Scottish Economy into the forthcoming 4th Industrial Revolution, the Scottish Government should consider (with the appropriate security) whether there should be a presumption in favour of all public services being based upon scalable public cloud infrastructures, and specifically a presumption against single use, single geography or a single public body bespoke infrastructure.

A Scottish data centre industry with access to international subsea cables has the potential not only to service domestic data needs but also service international markets too.



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Part C: Cross Cutting
Recommendations
(continued)

Key Recommendations

Digital & Technology

On this basis it is recommended that:

- 19. In conjunction with the regulatory reforms highlighted in 17, the Scottish Government should provide the leadership required to ensure the delivery of a full fibre network for Scotland by 2027 to enable the transition to 5G across the whole of Scotland.**
- 20. To ensure Scotland's place in the world and increase its international presence and connectivity resilience, the Scottish Government should prioritise support for an indigenous data centre market and investment in direct international fibre optic cables.**

A further challenge is how best to unlock the value of the already substantial amount of both public and private digital information held in Scotland. The ability to handle, interrogate and analyse this data in a more efficient and effective way will provide a solid foundation for taking informed evidenced based policy decisions to meet our net-zero carbon and inclusive economic growth commitments. There needs to be a fundamental change in thinking to view data as an asset, not an output as tends to be the case currently.

All new publicly funded infrastructure should consider the future data potential of the asset and also the digital services potential of the asset. All new assets should have embedded sensor technology to provide data which will give insight to the optimal operation of the asset and help to deliver new functionality and services from the asset. Also, this will help to reduce/avoid unnecessary consumption of resources. All new assets should be considered as a potential platform for the delivery of digital services to the Scottish public. Every major project should have a digital component related to data generation, storage and use. Every major project should consider how it will enable and facilitate digital communications services for the public good. Every major project should consider how it will make its data set publicly available where appropriate. This could bring benefits to society as a whole but could be life changing for individuals with impairments.

A further challenge is how best to unlock the value of the already substantial amount of both public and private digital information held in Scotland.



Buildings will become smart buildings, transport links such as roads or railways or ferries will become 'smart' i.e. sources of data and information as well as consumers of data and information. The IoT will revolutionise the optimum use of asset capacity, avoidance of unnecessary use and carbon consumption.

In order to meet our net zero carbon targets, investment cases for public buildings should consider the production and storage of data, the consumption data for optimisation and the facilitation of digital communications services for the public good.

On this basis it is recommended that:

- 21. From 2020, the Scottish Government should consider the future data requirements and data potential for all new publicly funded infrastructure as well as the potential for the use of digital services associated with the assets.**



£600m

investment
commitment to
reaching 100%
broadband
coverage



5G

could add £17bn to the
Scottish economy by
2034 and create
160,000 new jobs



Superfast broadband coverage has
increased by 5 percentage points
from 87% to 92%

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Key Recommendation **Role of the Public**



Much greater participation of the public needs to be incorporated as an integral part of infrastructure investment decision-making.





There is good evidence from multiple sources that achieving an inclusive net zero carbon economy over the next 30 years will be extremely challenging and will require changes to current priorities as well as some trade-off decisions to be made. In order to deliver against this, whilst there will likely be a requirement for institutional change, there will also be a need for behavioural change from consumers and users. The Commission has gathered evidence from its own research by Ipsos Mori as well as the UK National Infrastructure Commission, The Turing Institute and others on the potential for an increased requirement for an informed participation of the public as part of any change process, and the benefits this could bring to establishing and assessing trade-offs and potentially buy in for some of the challenging decisions ahead.

An example of this approach is through deliberative engagement methods seeking to take participants to a more informed position, as opposed to the more immediate response seen in some other methods, such as more binary opinion polls. This requires therefore, not simply an understanding of the priority areas for users of infrastructure, but also how they would trade-off preferences. This reflects the realities of policy and budgetary challenges which are rarely simple; providing a more meaningful insight to what is important to infrastructure users. The Commission would emphasise the benefits of this approach and the need for engagement which takes us to a more informed and mature relationship between user and policy-maker.

On this basis it is recommended that:

22. **By 2022, the capacity and capability requirements for an informed approach to public engagement and participation needs to be clearly established and implemented by the Scottish Government to ensure that short and long term outcome trade offs are effectively debated, understood and taken into consideration.**

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Key Recommendation **Independent, long-term advice**



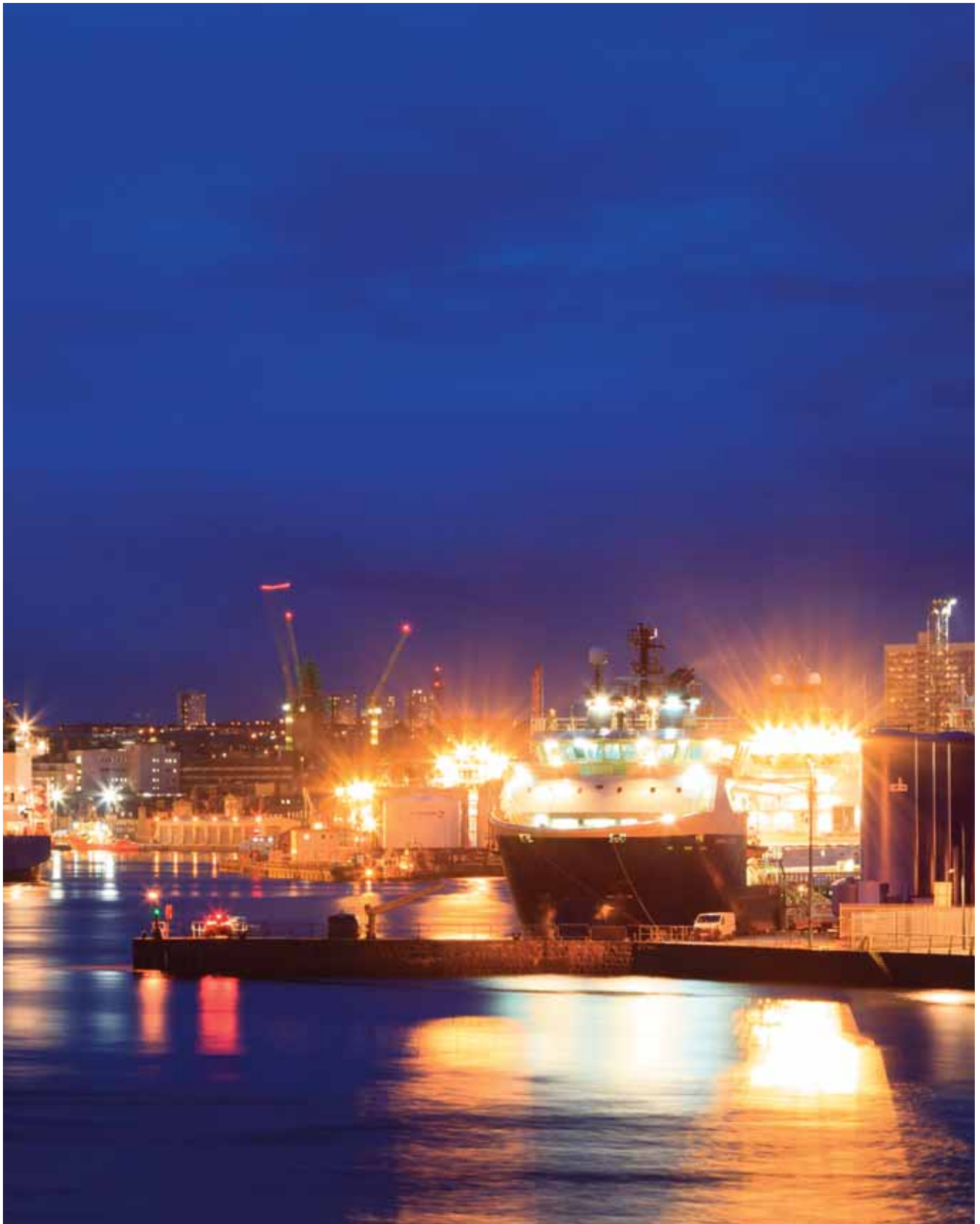
To enable government, regulators and industry to make the transition to a long-term, coherent systems wide approach to place-based infrastructure strategy and planning.

Infrastructure is by its very nature a long term consideration, with many major projects often a decade in the making with then many decades worth of useful life; indeed if appropriately managed and maintained their useful life can be extended into centuries. The true benefit and impact of infrastructure is also very often seen over a long, often inter-generational horizon. When the outcomes being sought – an inclusive net zero carbon economy – are also of such a long term nature, the importance of making appropriate long-term investment decisions worth £billions becomes even more critical. This is especially important when the scale and pace of change is accelerating and the future requirements require a degree of flexibility and adaptability; and where interdependencies of services, and the infrastructure that is required to deliver those services, is only likely to increase.

Experience from other countries including Australia, Netherlands, New Zealand, and the UK, indicate that in such a stage of transition it is increasingly important to establish a clearer, system wide, long term assessment of need across all infrastructure, to maximise the potential of investments being made – be that to enhance, adapt or repurpose existing infrastructure or in completely new or innovative infrastructure – and maximise the potential of the desired outcomes being achieved. In all of the examples reviewed, Ministerial decision making was still viewed as a critical component of this long term approach, however given the context described above the benefits of a strategic independent approach to inform these decisions was seen as an important component.

On this basis it is recommended that:

- 23. By 2021 a body should be given the responsibility by the Scottish Government to provide independent, long term, evidence-based advice to Scottish Ministers on investment decisions for the social, economic and natural infrastructure needs and priorities required to deliver an inclusive net zero carbon economy.**
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The importance of making long-term investment decision worth £billions becomes even more critical, especially during this period of accelerated change.

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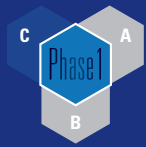
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Part C: Cross Cutting
Recommendations
(continued)

Next steps

The Commission is 12 months into an 18-month programme of work, and the recommendations set out in this report represent the findings of the first phase that has been focusing on the “why and the what” of infrastructure. As a result, a number of areas have yet to be considered by the Commission and will form the basis of the next phase of activity. The Phase 2 report will be aimed principally at the more downstream aspects of the work to date including the practical implications in relation to the “how” of infrastructure. This includes consideration of a Scottish National Infrastructure Company as set out in our remit. The Commission will continue to engage widely as we move towards the conclusion of our work during 2020.