

ICE submission – Infrastructure Commission for Scotland’s Call for Evidence

ICE Scotland is pleased to respond to the Infrastructure Commission for Scotland’s call for evidence in order to help inform the development of a 30-year infrastructure strategy for Scotland. Infrastructure is a key enabler for inclusive economic growth, connecting businesses and providing jobs, whilst underpinning thriving communities and improving quality of life.

The submission should be read in conjunction with ICE’s *State of the Nation Scotland 2018: Infrastructure Investment* report. The Infrastructure Transitions Research Consortium’s (ITRC) *Scotland National Needs Assessment (NNA) Demand Drivers* report has been referred to in part in the development of this evidence submission and is also supplied.

Executive summary

A significant amount of investment is planned for Scotland’s infrastructure in the coming years, with £25 billion allocated in the next parliament alone.¹ It is critical that the Infrastructure Commission for Scotland provides strategic advice to the Scottish Government, so that it is able to make effective investment decisions on infrastructure that can deliver long-term benefits to Scotland’s economy and its many communities.

Articulating a coherent view of what the key strategic drivers for Scottish infrastructure should be and the role that infrastructure networks plays in enabling inclusive economic growth, in “place making” and a low carbon future are paramount. Likewise, setting out an evidenced-based and impartial view of infrastructure demand is key to this objective, as is learning from international organisations that have undertaken similar prioritisation exercises.

To ensure that the Infrastructure Commission for Scotland’s advice to Scottish Government is as effective as possible, ICE Scotland recommends the following:

- The Commission should include resilience as an additional strategic driver for infrastructure provision, recognising that resilient networks are critical in order to better serve and protect Scotland’s regions, cities, and communities.
- In acknowledging the important role that green infrastructure plays in climate change mitigation and adaption the Commission should advise the Scottish Government to broaden its current definition of infrastructure in order that green infrastructure is included in any long-term strategy.

¹ Scottish Government (2019) [Infrastructure Commission Appointed](#)

- The Commission’s advice to Scottish Government should take a whole-life benefits approach to infrastructure investment and be framed within a systems context; at the local, regional and national levels also noting that “the Place Principle” was launched in Scotland last year.
- Across energy, rail, roads and water the Commission should set out its support for the finance and funding recommendations put forward in ICE Scotland’s *State of the Nation Scotland 2018: Infrastructure Investment* report² (as detailed in our response to question 3 (d)).
- The Commission should consult with international organisations (both governmental and non-governmental) that have undertaken similar infrastructure prioritisation exercises to identify and adopt best practice approaches. ICE will be publishing a study later this year that looks at best practice within this space.

² ICE (2018) [State of the Nation Scotland 2018: Infrastructure Investment](#)

1. The remit and in particular the Commission objectives provide an illustration of some key strategic drivers to an inclusive growth and low carbon economy:

a. What are your views on these drivers and are there any others that should be considered by the Commission?

Each of the Commission's strategic drivers are key to informing what provision of infrastructure Scotland requires now and in the future.

In devising an infrastructure strategy for Scotland, the Commission should pay close attention to those which are the primary drivers, and those that are enablers. For example, demographic and social changes are fundamental to influencing the location and capacity of key transport networks, whilst technological innovation is more likely to facilitate their optimum performance. An infrastructure strategy that is sensitive to these interdependencies is more likely to deliver an inclusive and low carbon economy.

An additional driver that the Commission should consider is resilience. Demographic changes such as population growth and ageing, alongside climate change and the increased risk of extreme weather events are changing the demand profiles of Scotland's future infrastructure networks.³ It is not enough that resilience is considered as one component of a wider design process for significant infrastructure assets, be they key transport hubs or energy generating facilities. Instead, resilience should be a primary driver and understood within a systems context; in so far as that the resilience of different infrastructure networks are interdependent.

b. What is the impact of these (and any additional) drivers on an inclusive growth and low carbon economy?

Each of these drivers has a significant impact on inclusive growth and a low carbon economy. However, to have a truly transformational effect on infrastructure prioritisation and delivery they must not be viewed in isolation, but instead as a group of symbiotic factors.

For example, Scotland's international competitiveness is inherently interlinked with the performance of its domestic economy, and quality of goods and services. In this respect there would be little to gain in prioritising investment in Scotland's physical connectivity with international markets if its domestic infrastructure limits the economic growth required to enable Scotland to flourish on the global stage in the first place.

It is also necessary to recognise that these drivers play out differently depending on the geographical context (rural versus urban) and that the capability of different communities to optimise their impact, in conjunction with the infrastructure that they each demand, also varies and as a consequence should be taken into consideration.

³ ITRC (2019) [Scotland National Needs Assessment \(NNA\) Demand drivers](#)

c. What are the key interactions and dependencies across these drivers?

The enabling drivers like technological change, alongside other cross-cutting issues such as finance and skills provision underpin the delivery of many of the other primary drivers. Achieving low carbon objectives will rely on the use of innovative approaches, appropriate investment and the right skills to ensure that the sustainability agenda is effectively realised. Hence, the enabling vs primary typology set-out in the response to question 1 (a) is critical to understand within this context.

That's not to say that there aren't dependencies between the primary drivers themselves. For example, it is obvious that the strength of Scotland's economic markets has a direct impact on individual businesses and the quality of life of all Scottish citizens. Scotland's infrastructure networks should be mapped out and considered based on the interactions of all of the key strategic drivers, whilst taking into consideration how they are likely to evolve over the next 30 years.⁴

d. What is the impact of each of them and cumulatively on Infrastructure demand and need now and for the future?

The report prepared by the ITRC⁵ sets out how a number of the strategic drivers that the Commission has identified along with their impact on infrastructure. A highest case population of 6.34 million by 2050 (representing a 17.3% increase on current levels) will increase demand across all infrastructure networks.

Some of the specific impacts can be summarised as follows:

- Projected ageing of the Scottish population will require additional investment in public transport provision
- Urbanisation prospects vary across Scotland, but population increases of between 5% and 10% in key urban areas to 2026, along with a general west to east migration, will place upward pressures on utilities and transport networks
- Economic growth will result in significant increases in infrastructure demand as people consume more energy and travel more when GDP is higher
- Climate change will impact loading extremes on key networks as the seasons change, for example latest projections for rainfall patterns show an increase in rainfall intensity of approximately 45% over the next 30 years which would cause increased water volumes in Scotland's sewers.⁶

⁴ ITRC (2019) [Scotland National Needs Assessment \(NNA\) Demand drivers](#)

⁵ Ibid

⁶ UKWIR (2015) [Rainfall Intensity for Sewer Design – Stage 2](#)

2. Infrastructure has a key role in relation to an Inclusive Growth and Low Carbon Economy:

a. What are your views on Scottish Government's definition of infrastructure as provided in the Commission remit, and are there any additional elements that should be considered, or areas that could be omitted?

The definition provided by the Scottish Government adequately covers those networks and assets that are traditionally defined as economic and social infrastructure. However, ICE Scotland believes that the Commission should also consider green infrastructure in its advice to Scottish Government. The European Environment Agency provides the following definition:⁷

'Green Infrastructure is based on the principle that protecting and enhancing nature and natural processes [...] are consciously integrated into spatial planning and territorial development.'

As well as enabling biodiversity and conservation, green infrastructure assets (such as street trees, garden roofs, woodlands and rivers) also play key role in climate change mitigation and adaptation.

b. What contribution does each of the infrastructure categories identified make to achieving an inclusive growth and low carbon economy?

The core economic infrastructure sectors (most notably transport, energy and water) are fundamental to inclusive growth and low carbon objectives. Taken together with digital communications technology they are the key enablers for the core operations of businesses across Scotland, providing connectivity between businesses, markets and people. They also play a critical role in sustaining Scotland's schools, hospitals and other social infrastructure.

The trunk road network in Scotland contributes £1.38 billion to the economy and employs approximately 31,000 people.⁸ When complete the £0.7bn Edinburgh Glasgow Improvement Programme⁹ (EGIP) will deliver greater rail connectivity between Scotland's largest two cities, unlocking major investment opportunities and boosting capacity by 30% by the end of 2019.¹⁰

In 2018 the energy sector accounted for £13.9 billion of exports (18% of all Scottish exports), whilst oil and gas production are worth £9.2 billion to the Scottish economy or 5.8% of total GDP.¹¹ In 2015 17.8% of Scotland's total energy consumption was from renewable sources contributing to the development of a low carbon economy.¹²

⁷ European Environment Agency (2017) [What is green infrastructure?](#)

⁸ Transport Research Laboratory (2016) [The Value of the Trunk Road Network to Society and the Economy in Scotland](#)

⁹ Network Rail (2018) [Edinburgh-Glasgow Improvement Programme \(EGIP\)](#)

¹⁰ egip (2018) [EGIP Project Overview](#)

¹¹ Scottish Government (2018) [Energy in Scotland 2018 Key Facts](#)

¹² Ibid

Scottish Water supplies 1.3 billion litres of high-quality drinking water to 2.4 million households and 159,000 business premises in Scotland every day.¹³ It also takes away and treats 840 million litres of waste water each day. Both are essential services that allow Scottish businesses and the public to function on a daily basis.

Overall, the contribution of the core economic infrastructure sectors to inclusive growth and the low carbon economy is highly significant and the Commission's advice to Scottish Government should articulate this clearly. In doing so it is also important to consider the role of infrastructure in achieving these objectives at different spatial levels and within both urban and rural environments.

c. What role and impact does each of the infrastructure categories identified have on the drivers identified in the Commission remit and objectives?

It is the view of ICE Scotland that each of the core economic infrastructure sectors has a substantial to critical impact on the strategic drivers identified by the Commission. The table in Appendix 1 highlights the significance of these impacts. It should be noted that the table also includes resilience as a strategic driver in light of our response to question 1 (a).

d. What are your views on the relative importance and impact of optimising whole life asset capacity through investment in enhanced renewals and maintenance compared to investing in and developing new infrastructure?

Both capital investment and maintenance spending are important components in ensuring Scottish businesses and citizens have access to high-performing infrastructure networks.

Capital expenditure is necessary when existing networks are unable to effectively manage changing demand trends. For example, the delivery of the new M8 motorway, electrification of the Edinburgh to Glasgow Programme and the Beaully-Denny powerlines each represent necessary capital investment geared at meeting a specific set of emerging demand challenges.¹⁴ However, this does not negate the role that existing infrastructure networks play in meeting current (and future) demand for infrastructure services.

As a basic principle ICE Scotland believes that each of the core economic infrastructure sectors in Scotland should take a whole-life approach to investment; in recognition that the performance, quality and safety of infrastructure networks are each optimised as a consequence of investment decisions that go beyond the initial cost of constructing a given asset.¹⁵

¹³ Scottish Water (2014) [Business Plan 2015 to 2021 Appendices](#)

¹⁴ ICE (2018) [State of the Nation Scotland 2018: Infrastructure Investment](#)

¹⁵ ICE (2016) [National Needs Assessment](#)

e. To what extent and in what way can infrastructure act as a catalyst for change in a place; be that at a community, local, strategic or national level?

Infrastructure is key to bringing about positive change in any place. There are basic linkages between a place or community and the infrastructure networks that are required to serve it; both in operational and resilience terms. Good transport provision will better support the connectivity of local businesses and communities, whilst robust flood defences will ensure that they are protected from extreme rainfall events. It follows that those infrastructure networks that are performing well (in terms of capacity and reliability) can have the greatest impact on a given place.

What is also critical for the optimum performance of infrastructure networks is an appreciation of the need to take a systems approach towards managing their inherent linkages.¹⁶ For example, if a community's flood defences do fail, too often the surrounding roads and utility supplies are also impacted as part of a cascade failure. Infrastructure can act as a catalyst for change in places across Scotland, is also critical for "place making" and an integrated approach to planning the delivery of essential networks should be taken.

f. To what extent and in what way can infrastructure act as a catalyst for:

There are many good examples of how infrastructure can act as a catalyst across the categories below. One such example is the recently completed £38 million Dundee Station redevelopment.¹⁷ It provides a gateway to the Dundee Waterfront, which is being transformed into a premier destination for business and leisure purposes.

i. increased economic investment and growth?

The redevelopment included the construction of a retail unit, a 2-storey café and a 120-bedroom hotel¹⁸ providing a boost to the local economy and creating many job opportunities.

ii. improved service delivery?

The redeveloped station now includes enhanced ticket facilities, a triple-height concourse and step free access.¹⁹ Each of these improvements means that the range of business and leisure facilities that have and are being developed across the Dundee Waterfront are now easier to travel to and from.

iii. improved community cohesion?

The job opportunities created by the redevelopment, alongside the enhanced access it provides to the Dundee Waterfront are benefits that the entire community can enjoy. Some of the amenities on the Waterfront, such as the V & A Design museum are also free to visit, creating a sense of belonging for all parts

¹⁶ ICE (2016) [State of the Nation 2016: Devolution](#)

¹⁷ Transport Scotland (2019) [Dundee Station redevelopment](#)

¹⁸ Ibid

¹⁹ Ibid

of the local community and its visitors. The station (i.e. the infrastructure asset) can therefore be considered as the linchpin for community cohesion in the area.

3. The demand and need for the infrastructure assets included in the Commission remit is considerable and wide ranging. Across all the infrastructure assets identified:

a. What is your assessment of the current infrastructure stock in terms of quality of provision?

Setting aside the impact of future demand trends, the quality of provision across some of Scotland's key networks and assets is generally encouraging.

A 2016 study conducted by Audit Scotland found that 87% of trunk roads and 63% of their local counterparts were in an acceptable condition, albeit there is a significant backlog in maintenance.²⁰ Alternative methods of financing Scotland's roads were considered in the ICE State of the Nation Scotland 2018: Infrastructure Investment report, with 55% of Scottish adults having indicated their support for a pay as you go model if it meant more money was spent on improving and maintaining roads in their local area.²¹

The number of passengers travelling by rail has seen sustained growth over the last two decades. Latest figures for punctuality on Scotland's rail network show that 67.8% trains were on time during the period 3rd March to 31st March 2019.²² Scottish Ministers have allocated £4.85bn in the next control period aimed at increasing capacity, improving inter-area connectivity, integrating transport more effectively and increasing inclusive economic growth.²³

The quality of Scotland's energy provision is moving in the right direction too, with a strategy for the sustainable generation of clean heat and electricity being pursued. Indeed, by 2030 the Scottish Government has set an ambitious target for 50% of heat, electricity and transport consumption to come from renewable sources.²⁴ At the last count in 2015 renewable sources accounted for 17.8% of energy consumption.

Scottish Water has invested around £10.8bn in its asset base over 19 years.²⁵ Even at this accelerated pace the investment is not enough to repair and replace assets as they wear out. Scottish Water is currently working with WICS and Scottish Government to establish the long term investment required over the next 30 years in order to do so.

²⁰ Audit Scotland (2016) [Maintaining Scotland's roads: a follow-up report](#)

²¹ ICE (2018) [State of the Nation Scotland 2018: Infrastructure Investment](#)

²² ScotRail (2019) [Performance Update](#)

²³ Transport Scotland (2018) [Railways Act 2005 Statement of funds available- control period 6 \(2019-2024\)](#)

²⁴ Scottish Government (2018) [Renewable Energy](#)

²⁵ ICE (2018) [State of the Nation Scotland 2018: Infrastructure Investment](#)

b. What is your assessment of the current infrastructure stock in terms of its capacity and fitness for purpose to meet current demand and needs?

Upward and changing pressures on the demand for infrastructure (population and economic growth, plus the impacts of climate change) will place a range of pressures on the different sectors in terms of capacity and performance.

New approaches to investment, both in capital and maintenance terms, detailed in our response to question 3 (d) will be required in order for each of the core economic infrastructure sectors to respond to these pressures and maintain fitness for purpose.

c. What is your assessment of forecast future needs and demand for infrastructure and the key areas of change and development over a five and 30-year horizon?

The ITRC report²⁶ sets out future demand across the core economic infrastructure sectors. Tables 2-7 highlight demand drivers across the full range of economic infrastructure sectors (energy, transport, digital communications, water, wastewater treatment and solid waste).

For transport the report suggests that both population and economic growth will mean that transport demand continues to increase well into the future, with infrastructure in the urban centres of Edinburgh and Glasgow being put under most pressure. Policies promoting modal shift, will change the profile of supply with greater demand being met by electric vehicles, light rail and tram systems. However, the impact of such policies is likely to be restricted to urban areas. Digital technologies (such as those associated with carpooling and smarter journey planning) will reduce the need for individual trips, but overall demand for travel is still likely to increase.

Under all population projection scenarios (low, principal and high) ITRC forecast a growth in overall demand for energy over the long term. Whilst the energy-intensity of Scotland's manufacturing sector is likely to decrease, this will be offset in part by growth in domestic energy demand brought about by increased homeworking. Smart grids and meters, alongside demand response management will curtail the rate at which overall energy demand grows, but policy decisions aimed at electrifying all modes of transport are likely to contribute to overall growth in energy demand.

As with transport and energy, demand for water is likely to increase in line with population growth and increased economic wealth. The supply-demand balance is a key measure of water resource sustainability. This balance is uneven across Scotland with much of the demand for water in the drier east. Population increase will also require more sewerage and treatment capacity, impacting both network size and capacity requirements, with the potential need for expanded trunk sewer capacity to accommodate increased wastewater volumes. In addition, climate change will affect the availability of water resources and the potential for extreme loads on infrastructure systems. Climate change, by changing patterns of average and extreme rainfall, will also drive increased volumetric requirements if sewer surcharging and flooding of wastewater are to be avoided.

²⁶ ITRC (2019) [Scotland National Needs Assessment \(NNA\) Demand drivers](#)

d. What do you see as the priority areas for investment in order to enable these future needs and demands to be met?

In its recent State of the Nation report,²⁷ ICE Scotland set out a number of priority areas for infrastructure investment.

Revenues from Vehicle Excise Duty (VED) and fuel duty are set to diminish as electric vehicles (which in the main are VED exempt) sales grow. Although not directly hypothecated to roads funding in Scotland, loss of revenue from these taxes will lead to a 'carbon fuel crunch'; as a consequence, prompting a rethink in how Scotland's roads are funded. To compensate for a loss of tax revenues associated with the phasing out of the sale of internal engine combustion vehicles, ICE Scotland has proposed a pay-as-you-go system to maintain investment in the Trunk Road Network.

During the delivery of Control Period 5 (CP5) a number of key rail programmes have either been delivered or commenced. These include the EGIP, Aberdeen to Inverness Phase 1, Highland Main Line Phase 2 and Borders Railway. Each of these are key to improving rail provision and ensuring that the network is ready to meet future demand. However, the delivery of CP5 programmes in Scotland has not been without difficulty. As such, the absolute priority moving forward – regardless of where investment is made in the network – is that increased efforts are made to identify opportunities for improved efficiency in delivery and maintenance, building on lessons learnt during CP5.

Growth in renewable electricity generation in Scotland has been impressive, but if the 2030 targets aforementioned are to be met then the Scottish Government's efforts to decarbonise heat should be accelerated. In addition, to increase the deployment of renewable energy further and to unlock the potential of emerging technologies like energy storage (critical for managing the intermittency of renewable energies) ICE Scotland supports continued use of the UK Government's Contracts for Difference (CfD) regime.

As aforementioned Scottish Water has invested some £10.8 billion in the water sector over the last 19 years.²⁸ However, to ensure assets remain fit for purpose and to reduce the risk of service loss there remains a need to increase expenditure on maintenance specifically. An increased emphasis on asset repair and replacement should be made as part of future regulatory cycles alongside a political commitment to ensure funding is available across multiple spending reviews. In addition, increased investment and use of data analytics to support delivery, operation and maintenance of assets should be realised.

e. Where do you see future convergence of need and demand having an impact across infrastructure classes?

Convergence between the key economic infrastructure sectors is likely to be most acute in Scotland's urban centres; particularly in those towns and cities where populations are growing fastest.

One example, driven by an ambitious government policy,²⁹ is likely to be the convergence between electric vehicle uptake and future power generation, which will present a number of challenges for decisionmakers and infrastructure providers alike.

²⁷ ICE (2018) [State of the Nation Scotland 2018: Infrastructure Investment](#)

²⁸ Ibid

²⁹ Scottish Government (2019) [Renewable and Low Carbon Energy](#)

According to McKinsey & Company the key problem that this presents is not in the amount of additional energy that is required to power electric vehicles (this is unlikely to be substantial), but instead the spatially concentrated peak loading that will result from the mass charging of electric vehicles in the evening or overnight.³⁰ In this respect, grid infrastructure will require remodeling and upgrading to meet this change in the profile of demand.

³⁰ McKinsey & Company (2018) [The potential impact of electric vehicles on global energy systems](#)

4. In relation to approaches to infrastructure assessment and prioritisation and across all the infrastructure assets identified:

a. What is your view on existing approaches to evaluation and assessment of infrastructure in Scotland?

There are a range of different approaches used by Scotland's key infrastructure clients to assess and prioritise infrastructure, with examples of good practice identifiable in each of these organisations. ICE Scotland believes that it is these organisations that are best placed to advise the Commission (via this call for evidence and through other channels as necessary) on what optimum approaches to infrastructure assessment and prioritisation look like. The objective of the Commission should be to analyse and use this feedback to inform the development of an integrated framework for prioritising all infrastructure across Scotland.

b. What is your view of good practice approaches to evaluation and assessment of infrastructure internationally?

A variety of approaches, both strategic and un-strategic, are taken around the world to evaluate and assess infrastructure need.

The approach taken in Australia is an example of good practice. Acting as an independent and impartial advisor to government, Infrastructure Australia, provides long-term and strategic advice on the prioritisation of nationally significant infrastructure projects. In 2016, this culminated in the publication of the Australia Infrastructure Plan, which sets out priorities and investable opportunities on a 15-year horizon.³¹ The approach is similar to that which is being pursued in the UK, with the National Infrastructure Commission having published impartial and expert advice to the Westminster-Government in the form of its National Infrastructure Assessment.³²

There are also good examples of international professional engineering institutions publishing infrastructure advice in unofficial advisory roles to governments around the world. This includes the American Society of Civil Engineers,³³ the South African Institution of Civil Engineers,³⁴ the Canadian Society of Engineers³⁵ and for the UK as a whole the ICE.³⁶

ICE Scotland believes that the Commission should seek to consult with the range of international organisations identified here to understand how good practice approaches to the evaluation and assessment of infrastructure have been developed.

³¹ Infrastructure Australia (2016) [Australian Infrastructure Plan](#)

³² National Infrastructure Commission (2018) [National Infrastructure Assessment](#)

³³ American Society of Civil Engineers (2017) [Infrastructure Report Card](#)

³⁴ South African Institution of Civil Engineers (2017) [Infrastructure Report Card for South Africa](#)

³⁵ Canadian Society of Engineers (2016) [Canadian Infrastructure Report Card](#)

³⁶ ICE (2016) [National Needs Assessment](#)

c. What is your view of existing approaches to the criteria and principles for investment prioritisation in Scotland?

Using the same approach as identified in our response to question 4 (a), the Commission should consult with Scotland's key infrastructure clients (via this call for evidence and through other channels as necessary) to identify best practice in the methods currently used to establish the criteria and principles for prioritising infrastructure investment. Again, the Commission's objective should be to develop an integrated strategy for investment prioritisation that spans all infrastructure sectors.

d. What is your view of good practice approaches to the criteria and principles for investment prioritisation internationally?

Good practice approaches to the criteria and principles for investment prioritisation are those that take into consideration a full range of infrastructure demand drivers i.e. they are both evidence-led and strategic. As acknowledged previously the strategic drivers (with the addition of resilience) that the Commission has set out as part of this call for evidence are each key in informing the infrastructure networks that Scotland will need well into the future and as a consequence act as a guide for the prioritisation of investment.

Good examples of this approach include Infrastructure Australia's' Infrastructure Plan,³⁷ the National Infrastructure Commission's Infrastructure Assessment³⁸ and also Infrastructure New Zealand's Thirty Year New Zealand Infrastructure Plan.³⁹ Each sets out a range of strategic drivers that are critical within the context of investment prioritisation, such as: population growth and ageing, climate change, innovation and low carbon policies, economic considerations and the depreciation of capital stocks.

e. What is your view on existing approaches and methodologies that enable cross infrastructure sector evaluation and assessment to be undertaken, and also the potential for further development of such approaches and methodologies?

Cross-sector evaluation and assessment are important given the inherent interdependencies between many of the core economic infrastructure sectors. ICE's National Needs Assessment⁴⁰ sets out a number of these interdependencies, all of which apply in a Scottish context. They include:

- The electrification of heat and transport to meet carbon reduction targets
- The impact of the digitisation of communications on electricity demand
- Growing demand for water from the energy sector for cooling
- The relationship between core economic infrastructure and housing demand
- Flood risk mitigation as a form of demand management for wastewater

³⁷ Infrastructure Australia (2016) [Australian Infrastructure Plan](#)

³⁸ ICE (2016) [National Needs Assessment](#)

³⁹ Infrastructure New Zealand (2015) [The Thirty Year New Zealand Infrastructure Plan](#)

⁴⁰ ICE (2016) [National Needs Assessment](#)

In order to effectively plan infrastructure provision across Scotland the Commission and the Scottish Government in due course should consider key interdependencies such as these in formulating a long-term infrastructure strategy for Scotland.

f. What is your view on existing approaches and methodologies that assess impact at different spatial levels, and also the potential for further development of such approaches and methodologies?

The National Infrastructure Systems MODel (NISMOD) developed by ITRC is a sophisticated modelling platform and database for UK-wide infrastructure systems.⁴¹ Parts of NISMOD focus on infrastructure networks, demand and performance within a spatial context and may be of potential use to the Commission.

g. What is your view on good practice approaches to assessing and establishing the post implementation impact on the desired outcomes from infrastructure investment?

Feedback to ICE Scotland from a number of stakeholders is that this is an area in which there has been limited progress to date. Primarily this is because it is significantly complex to measure the impact of infrastructure on socio-economic outcomes i.e. proving causality when there are so many circumstantial factors and externalities at play. More work is required to develop the appropriate metrics to enable such approaches to take place and so that there are more sophisticated systems for analysing the data that is produced as a result.

⁴¹ ITRC (2019) [NISMOD](#)

SCOTLAND

From roads to railways and bridges to power stations, high-performing infrastructure is vital for economic growth and thriving communities.

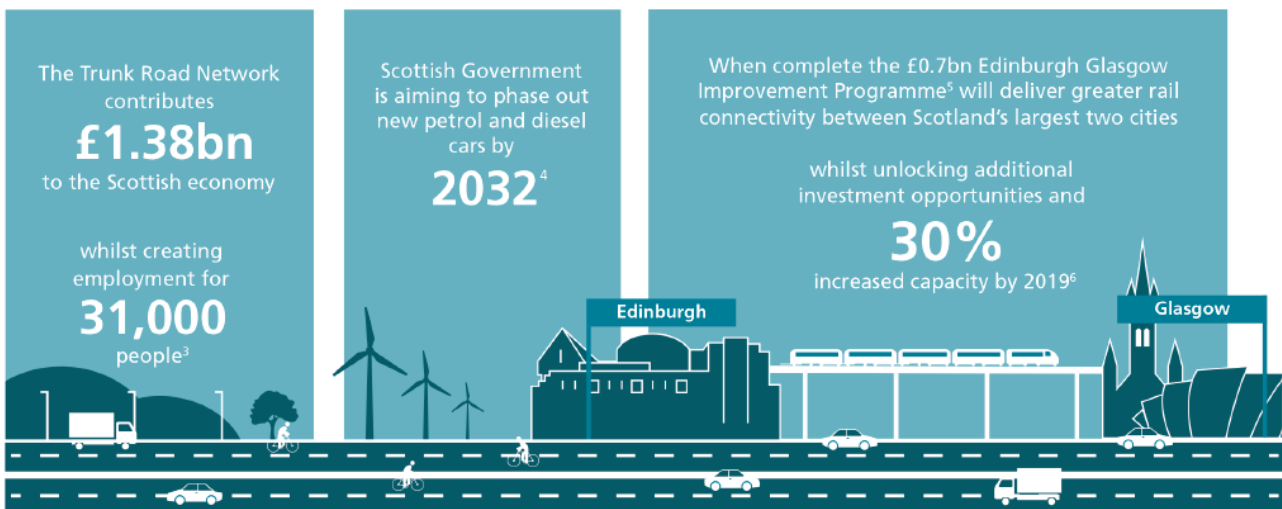
By 2025-26 Scottish Government has committed to increasing annual infrastructure investment by

£1.56bn¹



Scotland is aiming to generate the equivalent of **100%** of gross annual electricity consumption from renewable sources by **2020**

helping to protect the environment and creating economic growth²



1. Scottish Government (2018) Infrastructure investment: evidence summary
 2. Scottish Government (2018) Renewable Energy
 3. Transport Research Laboratory (2016) The Value of the Trunk Road Network to Society and the Economy in Scotland
 4. Scottish Government (2018) Programme for Government 2017-2018: First Minister's speech
 5. Network Rail (2018) Edinburgh-Glasgow Improvement Programme (EGIP)
 6. egip (2018) EGIP Project Overview

About ICE Scotland

ICE Scotland supports and represents over 8,000 members living and working in Scotland. ICE Scotland is a leading source of expertise in infrastructure and engineering policy and is widely seen as the independent voice of infrastructure. ICE Scotland provides advice to all political parties and works with industry to ensure that civil engineering and construction remain major contributors to Scotland's economy.

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Appendix 1: Infrastructure sectors and strategic drivers

Table 1: Impact of infrastructure sectors on strategic drivers (with resilience also included as a driver)

	Digital	Energy	Flood Risk Management	Transport	Waste Management	Water
Securing Scotland's international competitiveness	X	X	X	X	X	X
The markets and connections Scotland requires for goods, services and people	X	X	X	X	X	X
How to prioritise investment to deliver inclusive economic growth and low carbon objectives	X	X	X	X	X	X
Demographic and other social change factors	X	X	X	X	X	X
Place-making	X	X	X	X	X	X
Technological change and innovation	X	X	X	X	X	X
Considerations around development, ownership and financing of infrastructure, including Fair Work	X	X	X	X	X	X
Resilience	X	X	X	X	X	X
				Substantial	Significant	Critical

Table 1 highlights ICE Scotland's view that each of the core economic infrastructure sectors has a substantial to critical impact on the strategic drivers identified by the Commission. The table also includes resilience as a

strategic driver in light of our response to question 1 (a). The scores contained within the table represent the views of an expert steering group that was appointed to advise ICE Scotland on its submission to the Commission's call for evidence. The steering group was made up of a range of representatives with an interest in Scotland's infrastructure sector, including client and contracting organisations, legal and advisory, a business interest group and university.

