



Enabling Better Infrastructure:

12 guiding principles for prioritising and planning infrastructure



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Foreword



Sir Michael Bear,
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The United Nations (UN) Sustainable Development Goals (SDGs) have created a blueprint for a world in which we protect our planet’s fragile ecosystems while making sure that every person can flourish. If we want to see this vision realised, we will need better infrastructure. There can be no sustainable development without connectivity, clean water, sanitation, low-carbon energy and a host of other services underpinned by infrastructure.

In the last decade I have met many inspiring leaders with the vision to transform their countries via ambitious infrastructure investment programmes. The biggest challenge has often been how to transform this vision into a plan that is both deliverable and *achieves* the benefits expected.

In this report we have pulled together insights from countries that are tackling this challenge. Drawing on contributions from practitioners from across the globe and some of the world’s leading development organisations, it provides advice on how to develop a national vision, assess infrastructure needs and turn all of this into robust and deliverable strategies.

This report is, however, only the beginning. The discipline of strategic infrastructure planning is moving quickly, with new learning emerging all the time. The Institution of Civil Engineers has committed itself to capturing and sharing this learning through a dedicated resource hub. The hub will be vital as we face down the huge challenge of delivering the SDGs by 2030.

Our partners



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What is this report and who is it for?

In recent years a wide range of organisations have issued guidance on different aspects of strategic infrastructure planning and prioritisation.

We have reviewed this material and conducted interviews with practitioners from around the world. This report draws these insights together into a single source of guidance and illustrates them with a series of case studies.

We believe that this report will be useful for decision-makers grappling with the challenge of designing and delivering infrastructure planning and prioritisation processes that can:

- enhance the value delivered by a national infrastructure system;
- ensure that infrastructure strategies support the achievement of national priorities.

The report will also be useful to a wider audience of financial institutions, private infrastructure developers and infrastructure consultants and contractors. It draws on international best practice to describe three stages of national infrastructure planning:

1. establishing a national vision for infrastructure;
2. conducting a national infrastructure needs assessment;
3. creating a national infrastructure strategy.

Finally, the report provides insight and advice on six key aspects of the enabling environment for national infrastructure planning:

1. the institutional framework;
2. fiscal capacity and private finance;
3. data to support decision-making;
4. stakeholder buy-in and consultation;
5. legal and regulatory frameworks;
6. human capacity and capability requirements.

Illustrative case studies are used throughout, and we also include pointers to other sources of useful guidance.

How can it be used?

This report can be used as high-level guidance and a source of insight on what decision-makers could do differently to improve infrastructure planning and prioritisation.

Interviewees have stressed that there is no 'perfect' country whose approach to strategic infrastructure planning can be taken off the shelf and applied anywhere in the world. It is, however, possible to describe the outcomes needed from each stage of a sound process and give examples of how countries with different politics, governance, levels of economic development and a host of other local factors have set out to achieve them.

Resource hub and the wider programme

To complement the insights provided in this report, ICE has created a resource hub to signpost useful resources from around the world. As with any report post-publication, new insights and case studies will continue to come to light, which it will be beneficial to share.

In addition, the wider infrastructure lifecycle needs to be considered, as, once infrastructure is prioritised and planned, it needs to be delivered. The wider lifecycle comes with its own additional questions around the best ways to fund, procure, manage and operate new infrastructure. Case studies of and useful resources for this later stage of national infrastructure delivery will be captured on the resource hub so that all resources for infrastructure decision-makers are available in one place.

Reading resources, however, is only the start. In some instances, decision-makers may require additional support. ICE's work in advising decision-makers over the past 200 years has demonstrated that it is detailed discussion with groups of learned experts that really generates insights about how to support better infrastructure delivery and, ultimately, better outcomes for the public. Given the wildly different decision-making environments across the globe, it is important to maintain this principle.

The resource hub and wider programme will be continually reviewed and developed to ensure that decision-makers have ongoing support in a way that best supports them. In particular, the hub will be developed so that if the resources prompt questions, a mechanism for providing answers will be in place. The benefit of this approach is that these questions will help the programme to generate additional insights to place back onto the resource hub.

The wider programme will include the hosting of insight development events across the globe. These events will ensure that the collation of case studies around the 12 guiding principles continues and that decision-makers are better supported through debate and discussion, ultimately enabling better infrastructure. These events will also support continued updates to the resource hub.

The Institution is committed to maintaining the hub as an up-to-date source of insight. We will encourage practitioners to add new resources to support their colleagues around the world across the three areas outlined in the diagram opposite.

You can access the resource hub at www.ice.org.uk/news-and-insight/enabling-better-infrastructure. If you would like to contribute, please get in touch at enablingbetterinfrastructure@ice.org.uk.

Figure 1: The resource hub

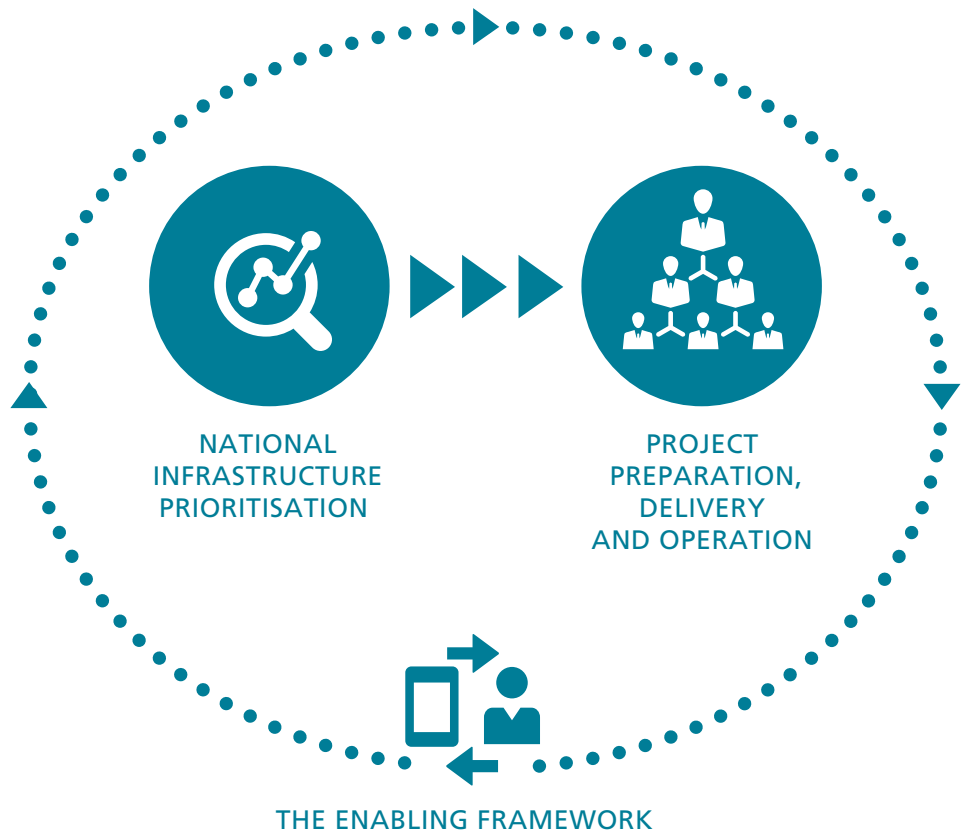


Figure 1: The resource hub includes resources covering infrastructure prioritisation through to project preparation, delivery and operation. It also includes case studies covering the wider enabling framework



Enabling Better Infrastructure: 12 guiding principles

1. Start by identifying your strategic objectives

Infrastructure is always a means to an end. Governments need to start with a clear view of what economic, social and environmental effects they want to achieve for their country. This will provide the context for identifying what outcomes are needed from the nation's infrastructure networks and which investments and policy measures are best placed to achieve them.

2. The UN SDGs provide a baseline for this task

Governments always want to achieve more with their infrastructure programmes than just economic growth, but it can be hard to articulate these wider goals. The 17 UN SDGs are at the heart of a global plan of action to secure sustainable economic growth, improve human lives and protect the environment. Research shows that infrastructure has a role to play in achieving all 17 goals and over 80% of the detailed targets that sit below them.

3. The best national strategic infrastructure planning systems embrace three stages: (i) they establish a vision, (ii) conduct a needs assessment and (iii) use that to build a national strategy

This does not mean that such a planning system is a one-size-fits-all model. These three stages can take many forms and come under different names; sometimes stages will be merged and some stages will start from a different point in the cycle. How they are delivered and by whom will also depend on local political institutions and traditions. The use of independent expert commissions to deliver impartial analysis to support the process is on the rise and is delivering positive results in terms of depoliticising the evidence base.

4. The national vision needs to reflect a country's national characteristics, the challenges it has inherited and its aspirations for the future

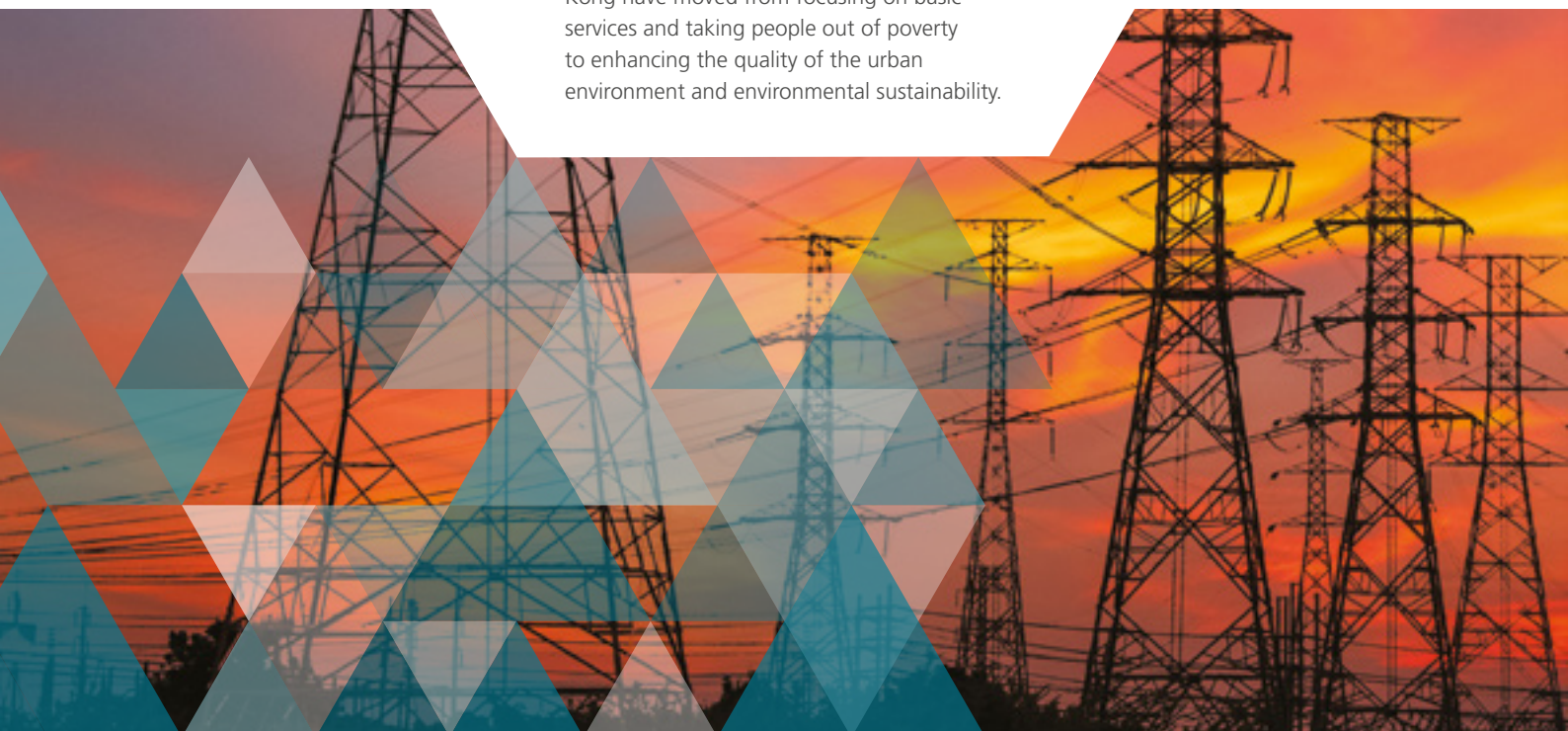
A national vision must be truly national. Wide and inclusive stakeholder engagement will be needed to establish buy-in to a long-term view of the nation's needs. A good vision homes in on the specifics of a country's situation. We found, for example, that South Africa is dealing with the legacy of apartheid, oil-rich states are focusing on diversifying their economies, and the Netherlands needs to manage intense competition for land use. Objectives also change over time. Over the last half-century, Singapore and Hong Kong have moved from focusing on basic services and taking people out of poverty to enhancing the quality of the urban environment and environmental sustainability.

5. The purpose of a needs assessment is to support evidence-based decision-making

Officials and politicians need to understand which infrastructure investments will be most effective in meeting national objectives. They also need to understand when no-build or low-build solutions such as demand management, environmental improvements or changes to regulation are better options. The most comprehensive needs assessments have included an assessment of the performance of existing infrastructure and a cross-sector analysis of future needs and of the factors, such as population growth, ageing and climate change, that are driving them. The best assessments have also highlighted the uncertainties, options and trade-offs between competing goals.

6. An infrastructure strategy needs to cover all aspects of implementation

The best strategies are much more than a list of priority projects. Ideally, they will cover all of the factors that need to be aligned to meet national needs and realise the vision. These can include: policy and regulatory change, funding and financing arrangements, developing human capabilities in government and the private sector, resilience and recurrent maintenance expenses, coordination across tiers of government and with private-sector partners, data sharing, monitoring and evaluation of progress, and the management of uncertainty.



7. Cost–benefit analysis (CBA) is vital for prioritising investments, but must embrace all of the environmental, social and governance (ESG) impacts of a proposal

Governments are interested in much more than the direct cash return from a project. Whatever CBA methodology is used it must capture the project’s wider impact on the economy and any social or environmental benefits generated. Above all, whatever the benefits identified, the project must be a good strategic fit with what a government is trying to achieve and be deliverable with the resources available.

8. A measure of affordability can focus minds

Our study found that experts conducting needs assessments and drafting strategies welcomed governments setting a measure of affordability for their work, arguing that it focused minds on how best to use limited resources.

9. Prioritisation can help avoid the affordability trap

Ruthless prioritisation is needed to allocate limited funds to those projects that bring the greatest development benefits over the long term. Developing countries without a large stock of basic infrastructure are particularly at risk of falling into an *affordability trap*, but not exclusively. There are investments that will deliver huge long-term benefits to a country but whose upfront costs appear prohibitive. States need to ensure that they understand how revenues generated by such schemes can make them affordable in the long run. Taking into consideration the long-term benefits of investment is therefore very important.

10. Governments should identify where private-sector involvement will deliver benefits and be clear on how they will be engaged

The private sector can play a big part in financing, delivering and, ultimately, operating the infrastructure needed to deliver a strategy. To attract this support, governments need to be clear about the basis on which the private sector will be engaged and then create stable and predictable legal and regulatory frameworks to enable this to happen. Governments may also need to grow their in-house capability to use models such as Public Private Partnerships (PPPs) to develop projects and take them to market.

11. High-quality consultation and stakeholder engagement should be an integral part of the process and should not be an afterthought

The best consultation processes do much more than try and secure public consent for a strategy or a specific project. They provide vital data and insight that allow changes to be made at an early stage, before their costs become prohibitive.

12. Governments need to focus on data quality and interoperability to unlock the benefits of digital transformation

Failure to get on top of the data challenge and provide planners with access to high-quality, right-time information will damage the credibility of the strategy and lead to poor decision-making. At the national level, governments have a key role to play in establishing interoperability, that is, the ability to share and manipulate data generated by different assets, networks and owners in order to provide a complete picture of the infrastructure system. This role is likely to include facilitating the creation of data standards and helping to overcome privacy and commercial barriers to data sharing.



Introduction

The crucial role of infrastructure in achieving sustainable development.



Oxford Economics estimates that the world will need to invest USD 94 trillion in infrastructure in the period leading up to 2040. This is 19% higher than what will be delivered under current trends.¹ Spending needs are greatest for electricity and roads, while Asia (dominated by China, India and Japan) has the largest overall need. A further USD 3.5 trillion will be needed to meet the UN SDGs for electricity and water.²

Infrastructure need is not, however, simply a question of numbers (albeit very large ones). It is not even about our increasingly interdependent networks of buildings and transport, water, solid waste, energy and communications assets. What really matters is that people can access the services and outcomes made possible by infrastructure. New communications links open up economic opportunities for whole populations; improved water supply and sanitation supports the social advancement of women; and electrification of transport systems will be central to bringing down global emissions of greenhouse gases and avoiding catastrophic climate change.

In fact, work led by UNOPS has demonstrated that infrastructure has a role to play in tackling all 17 of the UN SDGs and a direct influence on over 70% of the specific targets that sit below them.³

1 Oxford Economics (2017) Global Infrastructure Outlook

2 Ibid

3 UNOPS (2018) Infrastructure: Underpinning Sustainable Development

Why do governments need to be involved?

Against this backdrop, governments in all parts of the world are prioritising infrastructure investment as a way of driving inclusive growth, achieving the UN SDGs and meeting national aspirations. Different nations, of course, have different needs. An advanced economy with a large stock of existing assets and networks has very different needs compared to a developing nation trying to ensure that basic services are available to all of its citizens. The World Bank has, however, argued that, with the right policies, even low-income countries can meet their infrastructure goals and stay on course to limit climate change to 2°C.⁴

That caveat, “with the right policies”, explains why governments have to play an active role even in countries where ownership of much of the infrastructure is in private hands. At the most basic level, this is because the large-scale and long-term nature of infrastructure investment makes projects vulnerable to changes in policy and regulation. More broadly, the greatest benefits from infrastructure development

emerge at the system or system-of-systems level. A road delivers its value as part of a highways network, which in turn needs to function as part of a national transport system. If new housing is built with easy access to improved transport, further benefits flow but, in turn, create demands for water, energy and communications infrastructure and place pressure on the natural environment. Only a government has the authority (and responsibility) to secure this range of outcomes on behalf of all its citizens.

Of course, this task of converting aspirations into fully functioning, sustainable infrastructure networks is not easy. Lengthy project lifecycles mean that decision-makers must deal with very high levels of uncertainty. Short-term political considerations often exert too great an influence, and there can be an over-reliance on narrow, sectoral plans at the expense of cross-network integration. Inflexible legal and regulatory frameworks can hinder rather than enable progress, as does a lack of reliable data.

Consequently, in many parts of the world it is often difficult to identify a clear rationale for project selection, solutions that do not require huge construction projects are not adequately considered, corruption risk is

high, and system-level integration is not achieved. As a result, the full value of infrastructure investment to a country and its people drains away.

These challenges have afflicted advanced and developing economies alike. In response, governments in all parts of the world have been experimenting with ways to improve their performance in different aspects of their strategic role, including assessing need, setting a vision and objectives, creating a national strategy and prioritising investments or other interventions. They have also been looking at how to improve the enabling environment, including their policy and regulatory frameworks, public engagement processes, approaches to data, use of independent analysis and leveraging in of private finance and delivery skills.

The remainder of this report draws on this experience to provide insights and guidance to help key decision-makers ensure that people can access the infrastructure services they need in order to lead fulfilling lives balanced against the environmental sustainability of the planet.

4 World Bank (2019) *Beyond the Gap: How Countries Can Afford the Infrastructure They Need While Protecting the Planet*



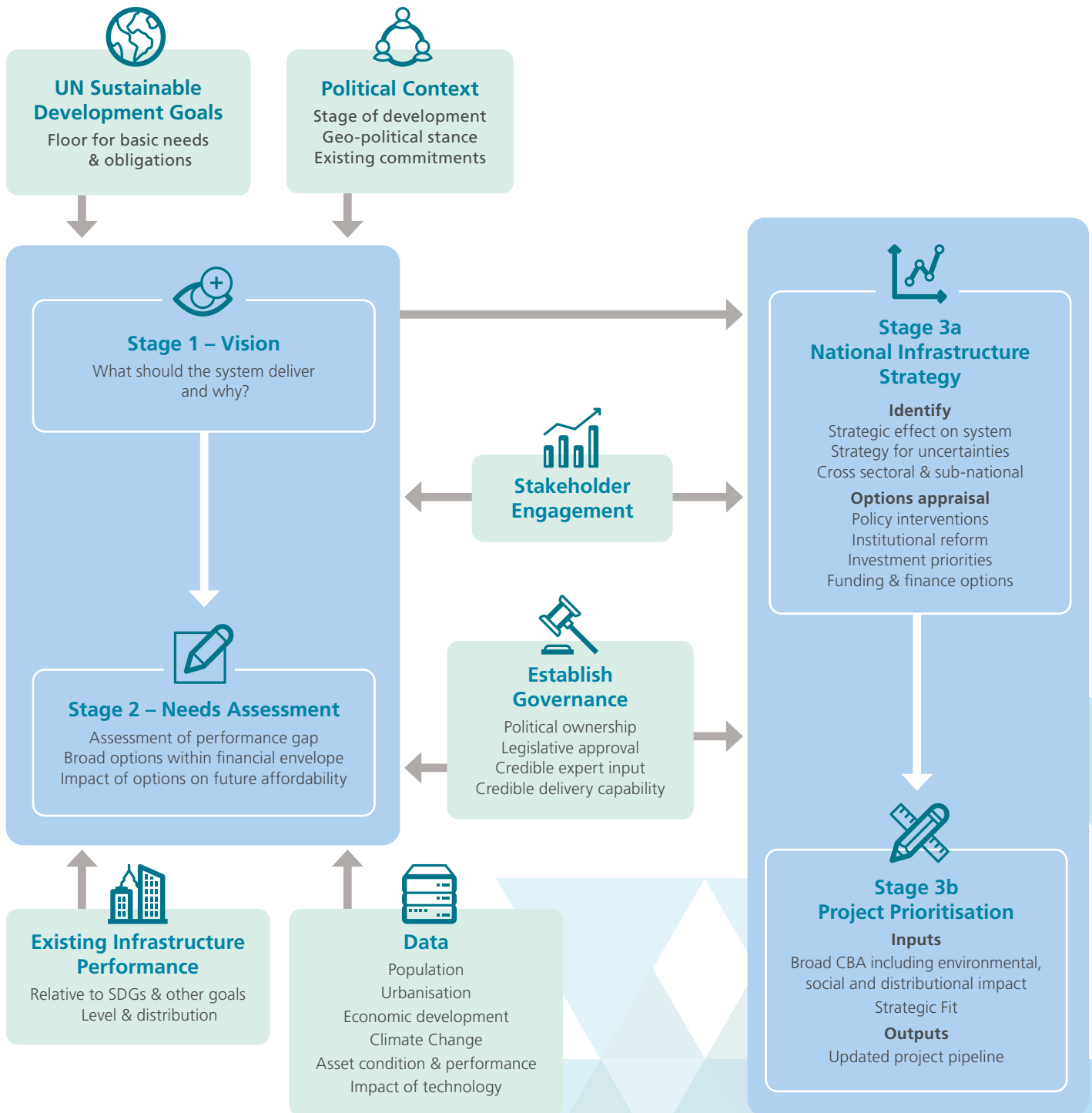
Section 1 – A three stage process for strategic infrastructure planning

The first and most important lesson from our study is that there is no perfect off-the-shelf model that all countries should try to follow. Our research and interviews do, however, highlight three stages that can, however they are configured, form the backbone of a *strategic infrastructure planning process* that can achieve all of the following goals:

- **maximise the infrastructure system's contributions to meeting national objectives** via a package of investments and other measures that are greater than the sum of their parts
- **improve public confidence in the process** via transparent and inclusive decision-making
- **grow investor and supply-chain confidence** unlocking private finance options and supply chain investment in delivery capability
- **improve project delivery and benefits realisation** via better coordination of the national strategy with any sectoral or regional plans
- **improve the affordability of future investments** via supporting sustainable economic growth.



Figure 2: Detail on the three stages and their relation to aspects of the enabling environment



Stage 1: Establish a national vision

Why is this important?

Planners need to understand what they are trying to deliver, to whom and why. This process of establishing a national vision is important because it provides a *single source of truth* about what is to be achieved. Without it, there is a real risk that national infrastructure plans are little more than a collection of unrelated projects, all pursuing different goals and making little systematic impact on a country's infrastructure systems.

What should be included?

Ideally, a national vision should include the following items.

- **UN SDG-related objectives:** The UN SDGs describe a set of common economic, environmental and social aspirations. A national vision is a good place to translate these aspirations into specific objectives for that country
- **Country-specific objectives:** Every country has unique priorities related to its history, level of economic development, geography and domestic political choices. Norway and many oil-rich Gulf States are currently prioritising diversification of their economies. Post-apartheid South Africa has focused on integrating rural, non-white communities into the national economy
- **A review of the continued relevance of previous objectives:** Objectives also change over time as a country moves through stages of development. Over the post-war period, Singapore and Hong Kong have both moved from focusing on provision of basic services such as water and sanitation to strategic priorities around quality of life, equality of opportunity and social cohesion.

Example: Malaysia 2020 Vision

In 1991, Malaysia established an ambitious national vision with the ultimate goal of becoming a *fully developed country* by 2020. This vision is used to shape long-term development plans and strategic targets, to which short-term plans and funding allocations are aligned. The use of

clear targets supports objective evaluation of progress. Consistent levels of growth have been achieved during this period. Inclusivity, however, remains a problem, with rural areas lacking connectivity to cities and, in some cases, to basic services such as energy and clean water.⁵

Figure 3: Nine objectives for the Malaysia 2020 Vision



⁵ United Nations Development Programme, Good Practices – Integrating the SDGs into Development Planning: Malaysia (accessed 01/11/2019)

Stage 2: Conduct a national infrastructure needs assessment

Why is this important?

Politicians and officials need to understand which infrastructure investments will make the greatest contribution to meeting the objectives of the vision. It is, however, important to recognise that new investments are not always the answer. Decision-makers need to be able to identify many other aspects of their *infrastructure package*.

A non-exhaustive list includes: upgrades, improved maintenance regimes, demand management, environmental improvements and deployment of technology.

A national infrastructure needs assessment that is methodologically robust provides the evidence base and analysis to underpin these decisions.

What should be included?

Ideally a needs assessment will include:

- an assessment of the current performance of the national infrastructure system in relation to the vision. This should include information on how any gap in performance affects different regions and social groups
- a multi-decade assessment of the possible impacts on the system of key drivers of changing demand, including population growth, demography, economic growth, climate mitigation and adaptation, and technological change
- options for closing any gap in the current and future performance of the infrastructure system. These options should be consistent with an agreed measure of affordability, e.g. the percentage of GDP to be invested in infrastructure annually
- a high-level assessment of the impact of the options on the national economy. This should be used to ensure that high upfront costs do not rule out options whose economic impact will make them affordable over the long term
- an assessment of the risks and uncertainties related to the different options
- a plan for an ex-post evaluation of the overall effectiveness of the assessment. This should be conducted well in advance of its next iteration.

Example: United Kingdom National Infrastructure Assessment

In July 2018, the UK's National Infrastructure Commission (NIC) published what is believed to be the world's most comprehensive National Infrastructure Assessment.⁶ The NIC was formed in 2015 and is charged with delivering a full national assessment once every five years. The assessment is grounded in the National Infrastructure Systems MODel (NISMOD) methodology (see Figure 4) and is comprised of a strategic vision and a set of recommendations for its realisation. Recommendations were made against a *fiscal remit* set by the UK Government of gross public investment in infrastructure of 1–1.2% of GDP each year between 2020 and 2050.

The NIC has published its own Lessons Learnt exercise into the first NIA⁷ and has committed to making improvements in areas including drawing out cross-cutting narratives, improving external challenge and improving identification and communication of trade-offs between objectives.

6 National Infrastructure Commission (2018) National Infrastructure Assessment

7 National Infrastructure Commission (2019) Lessons Learnt: Reviewing the process of the first National Infrastructure Assessment



Stage 3: Produce a national infrastructure strategy

Why is this important?

A national infrastructure strategy can convert the needs assessment into a credible plan for improving the national infrastructure system and realising the vision.

What should be included?

The core of a strategy will normally be a prioritised list of investment projects and a package of other interventions for improving

the performance of the system, for example, policy and regulatory changes.

Ideally the strategy should also explain:

- what processes will be used to ensure the plan can adapt to the uncertainties inherent in a multi-decade timeframe
- the processes for coordination with any subnational or sectoral plans
- the preferred funding and financing options
- the plans for education and training needed to create the human capacity needed to deliver the plan
- the processes used for measuring progress against milestones and evaluating the success of the plan in delivering the desired strategic effects.

What are the most important inputs into the three-stage process?

Our desk research and interviews highlighted a series of important inputs into any configuration of the strategic infrastructure planning process:

- **a credible needs assessment methodology** grounded in an assessment of the current and future performance of the assets and networks making up the infrastructure system. The assessment should generate a multifactor, cross-sectoral analysis of future needs and highlight where there are trade-offs between competing objectives
- **transparent and effective governance**, including a clear division of responsibilities between the political executive, the national legislature, permanent officials and any expert independent infrastructure commission or body
- **an agreed measure of short-term affordability** to focus decision-makers on the prioritisation of scarce resources and ensure that debt levels are sustainable. This could take the form of a floor and ceiling for public investment in the infrastructure system
- **an analysis of the impact of the strategy on economic growth and future affordability** to enable governments to make a judgement about the costs to be imposed on the public, in the form of either taxation or user charges, set against the benefits they will receive. This analysis must include the impact on future generations in the form of debt taken on by governments
- **clarity on private-sector involvement** in the financing, delivery and operation of infrastructure, including preferred funding, financing and procurement methodologies
- **stakeholder consultation processes** that provide valuable insights for planners and project developers and allow the public have their voice heard at the project level
- **project appraisal and selection processes** that can demonstrate value for money, affordability and delivery
- **project prioritisation and appraisal methodologies** that allow multiple economic, environmental and social objectives to be assessed while also demonstrating value for money, affordability and deliverability.

Example: South Africa's National Infrastructure Plan

The South African Government adopted its first national infrastructure plan in 2012.⁸

The plan was, in part, a response to the Government's *New Growth Path*, which sought to deal with the high levels of poverty, unemployment and inequality that the country continued to face nearly two decades after the end of apartheid. Many rural communities were particularly marginalised, and suffered from poor access to basic services and economic opportunities.

The vision was therefore for inclusive jobs and growth, with infrastructure identified as a key jobs driver that could lay the basis for higher growth, inclusivity (via integration of communities into the economy) and job creation.

A Presidential Infrastructure Coordinating Committee was established to:

- develop a single, common National Infrastructure Plan, owned and monitored by central government
- develop a 20-year planning framework and project pipeline to minimise the risk of disruption by short-term political decision-making
- coordinate, integrate and accelerate implementation across national government, agencies and social partners
- identify who was responsible for delivery and hold them to account.

The plan was based on detailed analysis of existing imbalances, projected demographic changes and international comparisons of the impact of changing urban form.

Published in 2012, it was built around a ZAR 827 billion investment programme focused on 18 Strategic Integrated Projects (SIPS). The SIPS included:

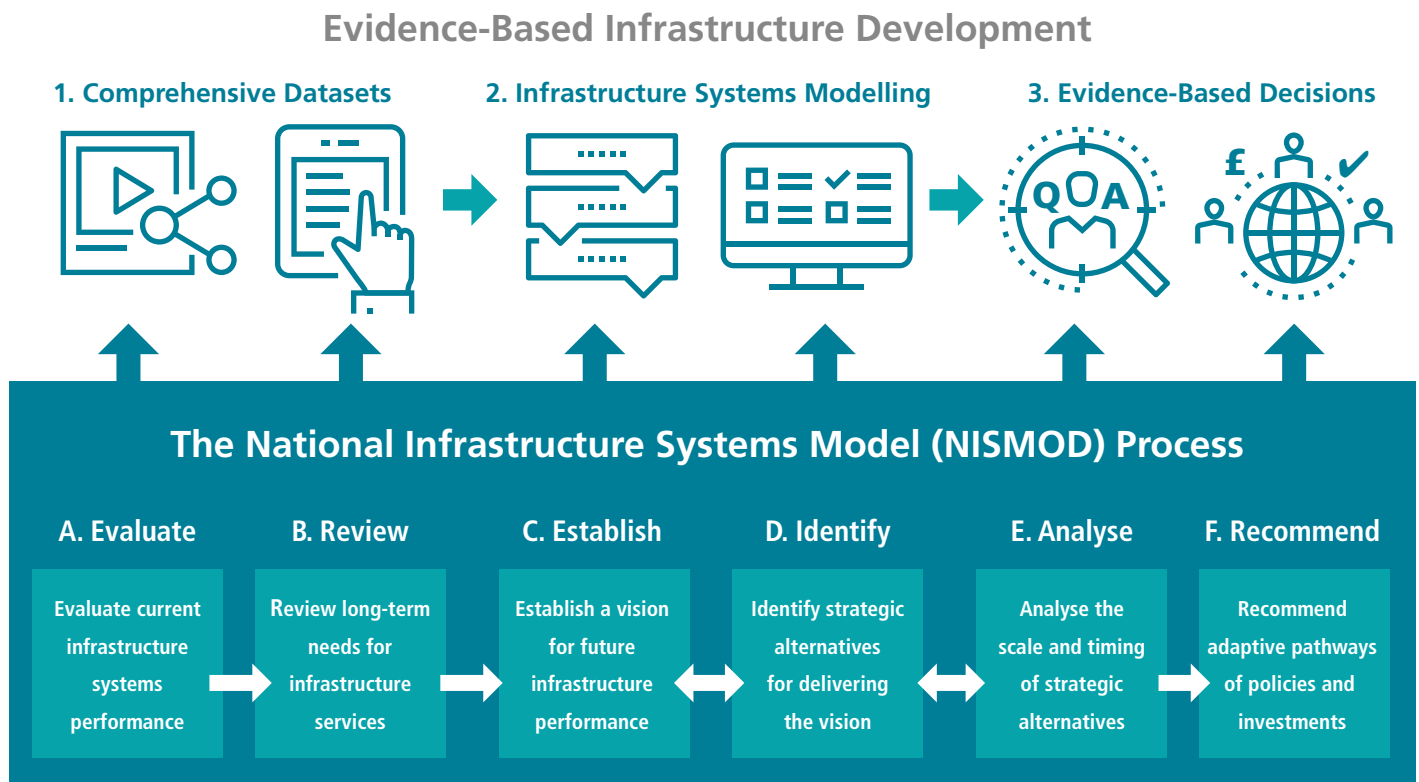
- **Geographic Projects**; for example, SIP 1 aimed to unlock the *Northern Mineral Belt* around Waterberg through rail, water and energy investments
- **Sectoral Projects** to address economic infrastructure gaps: SIPS 8, 9, 10, 15 and 18 all addressed backlogs and historical imbalances in energy, water and broadband services, with the ultimate goal of universal access
- **Social Infrastructure Projects**; for example, SIPS 12, 13 and 14 were aimed at healthcare, schools and higher education provision.

The plan also identified a series of enablers, including:

- a streamlined authorisation process to ensure construction was not delayed
- a programme to improve project initiation and delivery, and to clamp down on corruption
- a skills programme for each SIP aimed at developing local skills, attracting skilled South Africans working abroad and easing immigration requirements for specialist skills in short supply.

8 South African Government (2012)
National Infrastructure Plan

Figure 4: Summary of process for applying the NISMOD Tool



Example: Credible infrastructure needs assessment methodologies – NISMOD

NISMOD is a system-of-systems modelling and planning tool developed by a consortium led by the University of Oxford.⁹ The original UK tool is made up of four sections supporting the analysis of:

1. long-term performance of interdependent systems
2. risks and vulnerabilities in national infrastructure systems
3. impact of infrastructure on regional economic growth
4. a data and modelling platform to ensure transparency and traceability of the results.

A fifth section provides a series of open-source tools to help apply NISMOD outside of the UK.

The NISMOD tool has been used as the basis for National Infrastructure Assessments in the UK, Curaçao, Saint Lucia and the Palestinian National Authority. It has also been used to support resilience planning in China, Tanzania, Vietnam and Argentina. The process for applying the tool is summarised in Figure 4.

Example: Project Appraisal and Selection Procedures – Norway’s National Transport Plan

Norway operates a two-stage process for selecting and appraising projects arising out of its National Transport Plan (NTP). The NTP covers a 12-year period (increased from ten years in 2017). This timeframe allows the NTP to span several political cycles.

The NTP is multi-modal and is based on a common set of methodologies and assumptions that are shared by Norway’s various sector-specific transport agencies. Each agency, and also lower tiers of government, can propose nationally significant projects for inclusion in the NTP. These proposals are subject to a two-stage quality assurance process summarised in Figure 5. This system is designed to balance wide stakeholder input, expert advice and appropriately timed political buy-in.

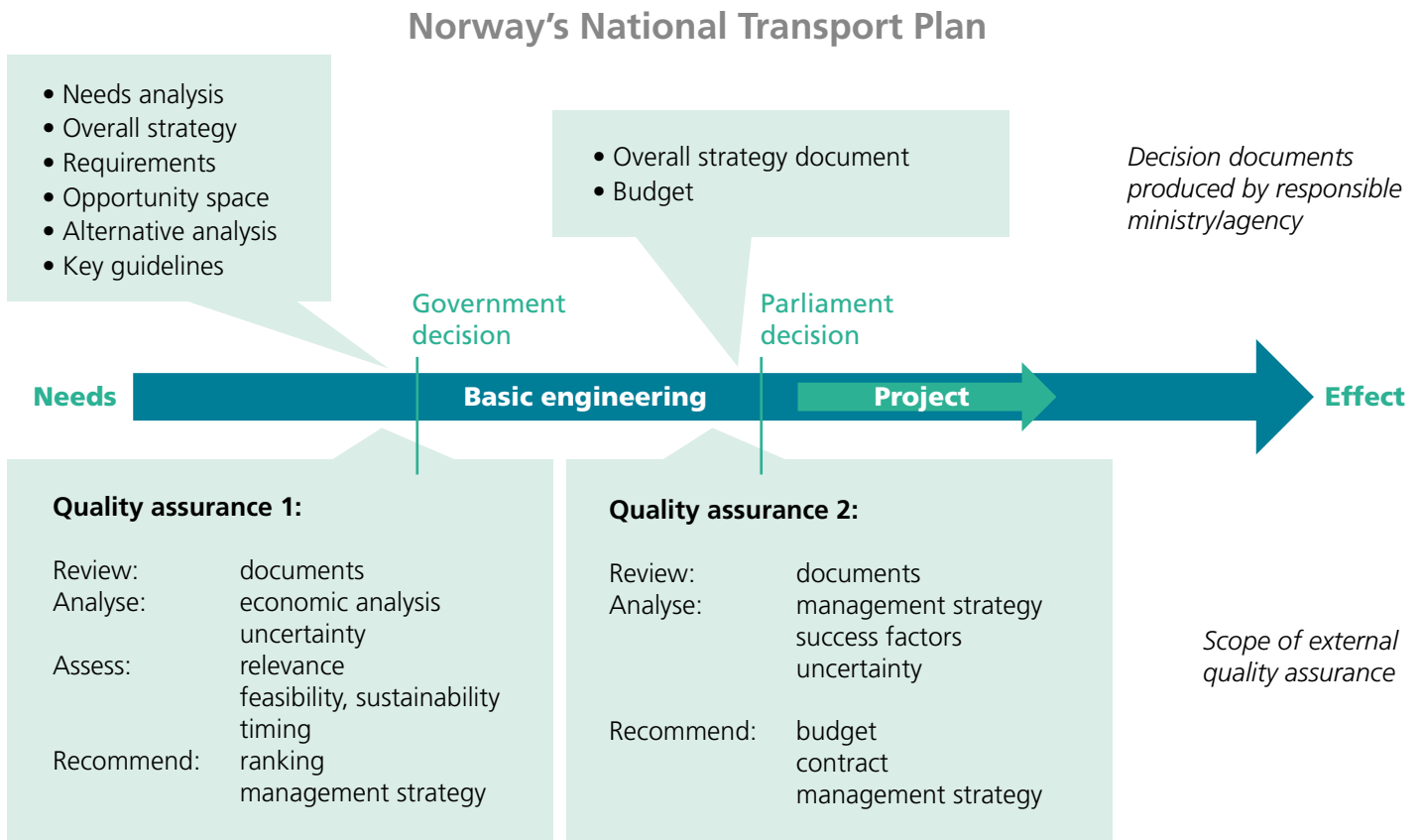
A recent OECD study highlighted the fact that Norway’s use of extensive early-stage stakeholder engagement allows schemes to be modified at a stage when making changes is less costly.¹⁰

Problems remain, however. Despite the extensive formal requirements of the CBA process, schemes with low CBAs continue to emerge from the process because of a combination of political and administrative factors. The OECD suggests a range of hard and soft solutions to these problems, including introducing a minimum net-positive threshold for any successful project and clearer flagging of CBA scores at the start of the political stage of the process.

9 Infrastructure Transitions Research Consortium (ITRC) National Infrastructure Systems Infrastructure Model

10 OECD (2018) Economic Surveys: Norway

Figure 5: Norway’s two-stage process for transport project appraisal



Source: Norwegian University of Science and Technology (www.ntu.edu/concept/qa-scheme).

Key challenges for implementing the three-stage core process

Scope of a needs assessment

The final choice of factors to be included in a needs assessment should always reflect local conditions and development priorities. Our research does suggest, however, that any credible assessment will need to include some or all of the following:

- **economic forecasts:** including inequality and imbalances within the country, global economic outlook and the rate of depreciation of the capital stock of existing national infrastructure
- **demographic variables:** including population growth, ageing and the pace and scale of urbanisation
- **condition and performance of existing infrastructure:** relevant factors could include transport bottlenecks, ability to cope with peak energy demand and future maintenance and replacement requirements
- **legal and regulatory demands:** including any international treaty obligations
- **climate change impacts:** including changes to flood risk and exposure to extreme weather events and an analysis of mitigation and adaptation requirements
- **technology:** an assessment of the impact and pace of technological change on different infrastructure networks.

Reducing politicisation

Total depoliticisation of infrastructure decision-making is neither possible nor desirable. A number of states have, however, begun to introduce measures to reduce short-term or opportunistic flip-flopping while preserving democratic oversight of the process. Measures include:

- **independent expert commissions or specialist agencies** with roles including:
 - o gathering evidence, conducting needs assessment and developing options
 - o ensuring stakeholder engagement is fair and thorough
 - o managing project initiation, procurement, financing and delivery
 - o monitoring strategy implementation and benefits realisation
- **longer-term strategies** with a life beyond a typical 4-5 year political cycle
- **special consent processes** for nationally significant projects.

The role of independent infrastructure bodies was a recurring subject in the literature and interviews. These can play an important role but are not panaceas; they need to be designed to function within the political system within which they will operate. What works in a centralised state such as France is not necessarily suitable within a federal system such as that of the USA.

Several interviewees stressed the importance of the relationship between the body charged with carrying out a needs assessment and national government and legislatures. The preference was for a body that is independent of the national finance or infrastructure ministries. Any independent body does, however, need strong central government support and a clear mandate for how its work will contribute to decision-making.

Incorporating all aspects of sustainable development into CBA analysis and project business cases

Interviewees stressed the importance of establishing a thorough appraisal process for assessing possible projects to be included in the national strategy.

The UK government has created a *five case model*¹¹ that leads decision-makers through five key questions about a proposed project:

- **Strategic case – Is it applicable?**
Is the proposal a good *fit* with national objectives?
- **Economic case – Is it appropriate?**
Is this the option that will deliver the most value to the public?
- **Commercial case – Is it attractive?**
Can it attract the finance and supply-chain interest to be viable?
- **Financial case – Is it affordable?**
Can it be delivered within the budget available?
- **Management case – Is it achievable?**
Can it be managed and delivered with the resources available?

Any model must assess all the relevant costs and benefits. Many infrastructure projects are attractive because of the effects they will have on the wider economy, for example, by increasing overall productivity in a city or region. More broadly, the importance of the UN SDGs to many of our interviewees highlights the need to incorporate all ESG considerations and also understand how the benefits from an investment will be distributed across the population.

Avoiding an implementation deficit

Strategies always run the risk of implementation deficit as short-term problems crowd out long-term goals. Measures to mitigate this risk highlighted by interviewees included:

- **legislative mandates and accountabilities** for bodies charged with delivering the strategy
- **unambiguous decision making structures** that allocate roles to named individuals and agencies
- **a clear line of sight** from the vision and long-term strategy through to shorter-term targets and investment decisions.

¹¹ HM Treasury (2013) The Green Book: central government guidance on appraisal and evaluation

Deep Dive Case Study 1

Incorporating UN SDGs into a National Infrastructure Assessment – Curaçao

Curaçao is a small island-nation in the Caribbean with a population of circa 150,000 and an economy orientated towards tourism, oil refining, shipping and international financial services.

Between 2016 and 2018 the government of Curaçao worked with UNOPS and the Infrastructure Transitions Research Consortium (ITRC), a multi-institution UK research team led by the University of Oxford. This team collaborated to develop an evidence-based assessment of Curaçao's future infrastructure needs and identify a package of investments and policy measures that could help meet the countries national development objectives through a strategy that is sustainable and affordable.¹²

NISMOD (described in Figure 4) was the foundation for this work. The exercise was also an opportunity to integrate the UN SDGs into the national planning exercise.

Previous work by the ITRC and UNOPS team¹³ had identified that 72% of the 169 targets for the 17 SDGs are influenced by the five key economic infrastructure networks (transport, water, energy, solid waste treatment and communications). In all, 31 of the SDG targets relate directly to services provided by infrastructure; for example, target 6.1 relates to the universal provision of safe and affordable drinking water. However, many more of the targets are indirectly influenced by infrastructure, for example, by provision of transport services that enable access to social services like education and healthcare.

To help understand how the SDG targets interact and where trade-offs may be required, the team also analysed:

- if targets addressed all three aspects or only a subset of a trilemma of affordability, availability and environmental sustainability
- if SDG targets could be met from an intervention from one infrastructure sector or would be impacted by multiple sectors.

Figure 6 shows the distribution of UN SDG targets in relation to the affordability, availability, environmental sustainability trilemma.

This analysis formed the basis of the team's work supporting the government of Curaçao to integrate the SDGs into its strategic infrastructure planning.

The first step was to map the location, interconnectivity and interdependence of existing infrastructure assets such as power plants and wastewater treatment works. Combined with data on performance, this provided an assessment of the level of service that Curaçao's infrastructure was providing to its people and its impact on the environment.

Next, 150 stakeholders from government, industry and non-governmental organisations (NGOs) were engaged to help establish a desired level of future performance. This exercise also addressed what level of performance was compatible with sustainable development, including factors such as how much clean water would be needed per person.

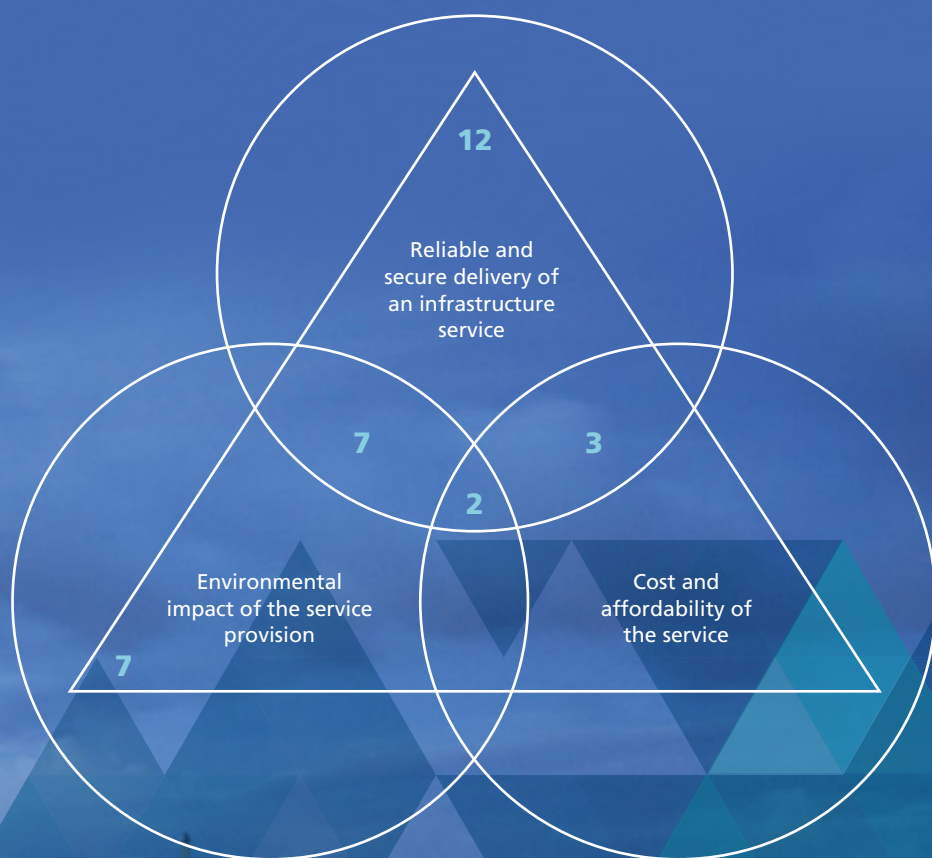
12 UNOPS, ITRC, Government of Curaçao (2018) Evidence-Based Infrastructure: Curaçao

13 UNOPS (2018) Infrastructure: Underpinning Sustainable Development



This formed the evidence base for a series of options for packages of investments and policy measures that would allow Curaçao to reach the desired level of infrastructure performance and deliver against the SDGs. The performance of these packages was modelled against scenarios for future demand driven by key factors such as population and tourism growth. The scenarios helped identify opportunities to build flexibility and resilience into the infrastructure system in order to mitigate the risks created by the island's exposure to sea-level rise and extreme weather events. The scenarios were also a useful aid in agreeing which potential investments were likely to be a poor use of limited resources. Finally, the exercise highlighted both quick low-regret wins and specific trade-offs, for example, between the positive benefits for waste treatment, as well as energy, from an investment in energy from waste treatment facilities balanced against the negative impact this would have on the funds available for renewable energy and recycling facilities.

Figure 6: Summary of process for applying the NISMOD Tool to specific UN SDGs



Deep Dive Case Study 2

Strategic infrastructure planning in a federal system – Australia

Background

A federal system of government can add an additional layer of complexity to strategic infrastructure planning. In the last decade, Australia has evolved a system that has made strides in dealing with this complexity.

The central government in Canberra (the Commonwealth government) collects all personal and corporate income taxes, sales taxes and excise duties, giving it significant leverage over spending at state level, which it exercises via grant funding.

States do, however, generate their own revenue through land and other taxes. Each state also has its own institutional framework to support long-term infrastructure planning, project development and delivery.

Infrastructure Australia

In 2008, the Commonwealth government established Infrastructure Australia (IA). Unlike its UK counterpart, it operates on a statutory footing, with its powers and responsibilities set out in the Infrastructure Australia Act 2008.

The multi-stage process overseen by IA is a good example of how strategic infrastructure planning should be informed by a strong evidence base and result in a package of measures including both investments in physical assets and policy reforms.

To this end, IA's key outputs are:

- the Australian Infrastructure Audit,¹⁴ which presents a forward-looking view of Australia's infrastructure needs, including a prioritisation of nationally significant projects and programmes. The audit is updated every four years
- the Australian Infrastructure Plan,¹⁵ which sets out policy responses to these infrastructure needs on a 15-year timescale updated every four years
- the infrastructure Reform Series¹⁶ of studies, which advises government, industry and communities how best to implement these policy responses
- the Infrastructure Priority List,¹⁷ which aims to ensure that public funds are directed towards projects that will deliver the best outcomes for the Australian population, updated annually.

The most recent audit was published in July 2019. Figure 7 shows how this is intended to flow through into the infrastructure plan and priority list.

The infrastructure priority list guides the allocation of funds to projects at both the national and state levels.

The IA Board oversees independent evaluation of proposals for inclusion on the list against the criteria of:

- strategic fit with the National Plan
- economic, social and environmental value
- deliverability.

Projects can be submitted at four different stages, mirroring IA's structured evaluation process:

1. problem identification and prioritisation
2. initiative identification and options development
3. business case development
4. business case assessment.

IA also oversees a process of post-project completion review to assess if the desired outcomes have been achieved.

The 2019 Infrastructure Priority List identifies 121 nationally significant infrastructure proposals, with eight High Priority Projects, 10 Priority Projects, 29 High Priority Initiatives and 74 Priority Initiatives. This is intended to provide all levels of government, private investors and the supply chain with an evidence-based list of infrastructure investment opportunities for the near, medium and longer term.

IA is not directly involved in decision-making on the funding and financing of individual projects. The Federal and State governments have, however, established shared policy and guidelines for PPPs, ensuring a degree of consistency in how projects are taken to market.

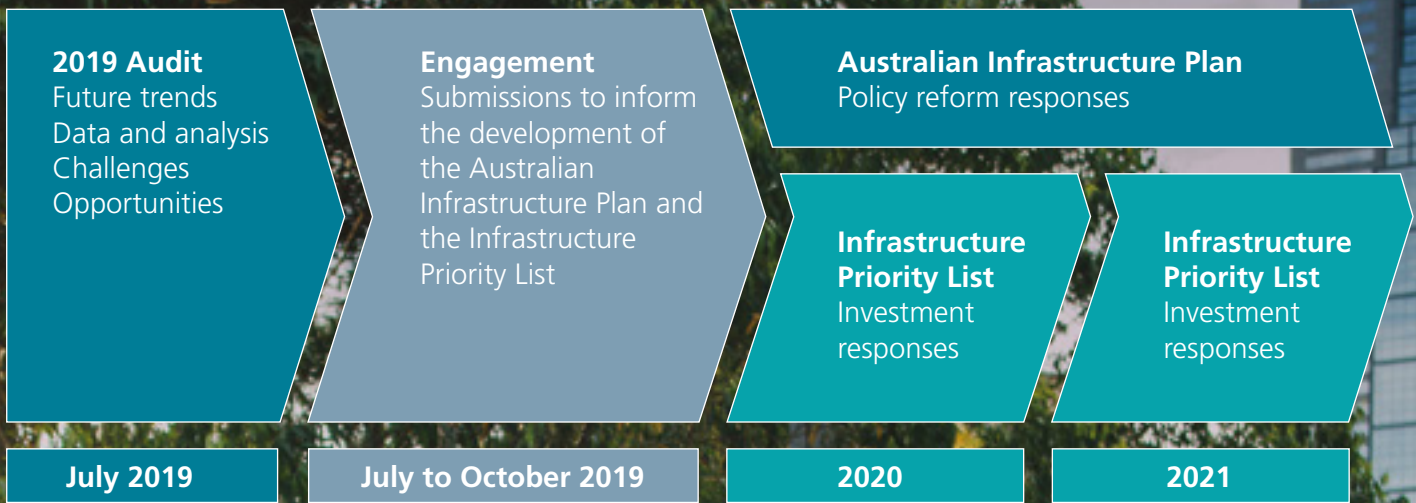
14 Infrastructure Australia (2019) Australian Infrastructure Audit 2019

15 Infrastructure Australia (2016) Australian Infrastructure Plan 2016

16 Infrastructure Australia (2019) Reform Series

17 Infrastructure Australia (2019) Infrastructure Priority List

Figure 7: Australia's strategic infrastructure planning process



State-level infrastructure planning

All of Australia's six states have established their own infrastructure plans and pipelines, but their time horizons vary: the Northern Territories' plan looks out ten years, that of New South Wales 30, and those of the remaining states 20.

Five of the six states have also established their own infrastructure commissions to provide independent advice and analysis, with the most recent, Infrastructure Western Australia, coming into operation in July 2019.

The roles of these bodies vary, but their responsibilities cluster around:

- advising on strategic priorities and leading the creation of state infrastructure plans
- coordinating upwards, including for submissions for inclusion in the IA priority projects list
- coordinating downwards and across to other state-level agencies and to municipalities
- project evaluation and assurance
- advice and support on funding, financing and procurement of major projects.

Impact

Assessing the overall impact of Australia's system is difficult. There are, however, some clear positive signs.

IA reports that, since 2015, AUD 123 billion worth of projects have commenced, with a committed forward pipeline of AUD 200 billion.

Infrastructure Partnerships Australia, an independent think-tank, publishes an annual *Infrastructure Investment Report* based on detailed interviews with major investors and potential investors in the Australian market.

The 2018 study¹⁸ found that 90% of the organisations surveyed were highly likely to invest (rising from 70% in previous studies). Similarly, 70% reported that Australia's track record of infrastructure business gave them confidence to invest, despite concerns about federal-level political instability over the last decade.

On the negative side, the same study reported that 87% of respondents were unhappy with the high level of uncertainty in the energy sector. This mirrors the concern highlighted in IA's 2019 audit¹⁹ that "Policy uncertainty and poor coordination has

affected investment in the energy sector and delayed an effective response to rising energy prices, impacting energy reliability and increasing community anxiety regarding climate change. Over the past decade, the unit price of electricity has risen in real terms by 56%".

Other negatives identified by IA itself include:

- inconsistent progress in reducing greenhouse gas emissions, down by only 3% from electricity generation, but up 9% from transport
- digital inclusivity not being shared with the poorest fifth of the population
- 39% of subsidies to support *community services* lacking evidence of being targeted effectively on those in most need.

18 Infrastructure Partnerships Australia (2018) *Infrastructure Investment Report*

19 Infrastructure Australia (2019) *Australian Infrastructure Audit 2019*



Section 2 – The enabling environment: six elements

The previous section describes a three-stage process for delivering a high-quality, high-impact national infrastructure planning system.

This section describes the most important elements of the *enabling environment*. The latter is made up of a range of institutional, knowledge and human elements. These elements need to be developed concurrently to create a supportive context for the creation and implementation of a national infrastructure strategy.

Our research and interviews have highlighted the six most important elements of the enabling environment that can support that process.

The six most important elements of the enabling environment and why they are important

(i) Institutional architecture

Why is this important?

The complexity of infrastructure planning means that some division of labour between governmental organisations is inevitable. There are also multiple interfaces between officials, politicians, private investors, owners and delivery organisations and the public who pay for and consume infrastructure services. This complexity is compounded by the fact that these groups often operate to different time horizons; for example, officials will normally be tasked with taking the long view, while politicians need to deal with relatively short-term political cycles.

What should be included?

To cut through this complexity, our research and interviews suggest that governments should be proactive in the following areas:

- **defining accountabilities and responsibilities**, including differentiating between political and administrative roles
- **cross-government coordination**, including establishing procedures for coordination of planning and delivery between central government organisations and regional and municipal tiers of government. If an independent expert infrastructure body exists, its rules of engagement should be included in this task
- **identifying the role of the private sector**, communicating this role clearly, and developing the capability inside government to engage effectively
- **dealing with corruption**: creating and enforcing a system for dealing with this risk.



Example: UNOPS Capacity Assessment Tool for Infrastructure (CAT-I)

The CAT-I²⁰ is one of several tools that have been developed by UNOPS. It aims to support government partners to take ownership of their capacity development agenda by gathering evidence on the enabling environment and their capacity to plan, deliver and manage their infrastructure systems. The CAT-I assesses the set of elements that are involved in all stages of the infrastructure lifecycle. In particular, the CAT-I analyses the governance mechanisms that provide the policies, processes, codes and standards, enforcement and regulation mechanisms, and financing and legal frameworks that control the process of infrastructure planning, design, procurement, construction, operation, maintenance and disposal of infrastructure assets. Furthermore, the CAT-I analyses the adequacy of the human resources available to carry out the actions required. The key output from the CAT-I is a prioritised roadmap of actions, programmes and projects to improve the capacity of the enabling environment.

To date, the CAT-I has been used six times around the globe to create targeted and prioritised capacity-building roadmaps. In **Brazil**, the CAT-I was used to identify 68 actions for improvement, which were then prioritised into nine actions to complete first. One action, completed immediately, was to create legislation that extended the infrastructure planning cycle from the five-year political cycle to a longer-term 15-year planning cycle. This aimed to reduce the impact of politics on infrastructure planning and investment and to support a more technical and evidence-based approach. In **Turkana County, Kenya**, the government partner did not even wait until the completion of the assessment before they started to make changes, creating an inter-agency working group to break down sector silos so that infrastructure could be planned using a system-of-systems approach.

Example: Preventing corruption in Hong Kong

The former British Hong Kong Government introduced legislation in 1974 for the establishment of the Independent Commission Against Corruption (ICAC) to tackle long-standing problems of corruption. Since 2007, the current Hong Kong Government has used a two-envelope system, in which technical quality is assessed before pricing is considered, reducing the opportunity for inflated budgets and kick-backs.

The Development Bureau of the Hong Kong Government also issues regular updates to its *Integrity Management Manual* to provide detailed guidelines on:

- acceptance of advantages (gifts, loans, etc.)
- conflicts of interest
- personal conduct
- acts of misconduct
- supervisory accountability.

This all complements the work of ICAC and its three-pronged strategy of law enforcement, prevention and education. ICAC is independent of the Civil Service, with its Commissioner reporting directly to Hong Kong's Chief Executive.

20 UNOPS Capacity Assessment Tool for Infrastructure



Example: National/regional coordination – the Netherlands’ Multi-Year Programme for Infrastructure, Spatial Planning and Transport (MIRT)

The Netherlands is a small, densely populated country in northern Europe that faces many competing demands for its highly constrained supply of land. The MIRT is a framework agreed between national and regional governments to improve the planning and integration of the infrastructure that supports a variety of land uses, including industry, residential, energy generation, nature and leisure.

Under the MIRT, national and regional governments collaborate to find a common solution to specific problems. Decision-making is based on multifactor analysis, and tries to

avoid solving one sector’s problems at the expense of the needs of other stakeholders.

The Dutch Government gives the following example of how this system should work.²¹ The Ministry of Infrastructure and Water Management and a regional government want to tackle the daily tailbacks on a section of motorway. Transport experts’ initial solution is to upgrade the motorway. However, under the MIRT arrangements, the Ministry contacts the province, the municipalities and the regional business community. It emerges that the province has conducted a mobility analysis and knows that the tailbacks are caused mainly by local commuter traffic to and from a business park. The municipality has, in turn, just launched a programme to encourage residents to cycle. Together, all parties arrive at a shared objective: improving mobility

between residential areas and the business park while also improving residents’ health. Following an exploration of several solutions, they agree to pursue a package involving an express bicycle connection to the business park, combined with agreements with employers to promote cycling and flexible working hours.

Stakeholders know that MIRT projects can be either implemented through public financing or through PPPs on a Design-Build-Finance-Operate-Maintain (DBFOM) basis.

Each year, a portfolio of MIRT projects is presented to the Lower House as an appendix to the budget of the Ministry for Infrastructure and Water Management, providing national level political and fiscal commitment to the programme.

(ii) Legal and regulatory frameworks

Why is this important?

A coherent and stable legal and regulatory framework is often the key differentiator between countries that successfully implement their infrastructure strategies and those that fail to do so.

All parties, both public and private, need to understand the rules of the game, be confident that they will be enforced, and believe that change will be evidence-based and predictable.

States with stable and predictable regimes will find it easier to attract private finance and encourage domestic and international supply chains to invest in delivery capability.

What should be included?

To build this confidence, governments should focus on:

- **maintaining the overall clarity, consistency and stability** of the legal and regulatory regime
- **establishing a track record of regulatory independence** grounded in objective, impartial and consistent decision-making
- **transparency and predictability** of processes for adapting to change, ideally grounded in evidence provided by a needs assessment (see Section 1)
- **coordination** of central and subnational legal and regulatory activity.

(iii) Affordability and private-sector financing

Why is this important?

A deliverable national infrastructure strategy will be based on a clear-sighted view of the nation’s fiscal capacity. In essence, a country must be clear about what it can afford, the level of debt it is willing to take on in pursuit of its strategic goals, and which assets it is willing to transfer to the private sector.

This assessment should not be narrowly focused on initial capital costs. States should recognise that good infrastructure investment decisions can drive the economic growth that will make those investments affordable in the long run.

Developing countries are particularly vulnerable to this affordability trap, in which the upfront costs of vital infrastructure appear prohibitive. In this context, it is particularly important to establish the role of the private sector and international development institutions in the financing, construction and operation of infrastructure. As part of this process, governments will need to be able to demonstrate to investors that they have made a realistic assessment of the funding streams that will be available to service privately financed infrastructure projects.

What should be included?

Governments should focus on:

- **establishing a measure of affordability** suitable for their goals and level of development. The UK’s fiscal envelope of

a public investment of 1–1.2% of GDP reflects its advanced economy status with mature infrastructure networks and high levels of private investment. The same level will not be adequate for a developing nation lacking the UK’s large capital stock of infrastructure and an enabling environment conducive to private investment

- **establishing outcomes-based commercial mechanisms** that reward investors on the basis of the quality of public services delivered through infrastructure assets
- **facilitating investment that optimises the whole-life maintenance cost** that reverses the depreciation of the value of existing infrastructure as well as the creation of new assets
- **establishing a framework for the use of PPPs** or a similar model that can lever in private capital alongside public funds. Governments should also **professionalise their ability to take these projects to market**
- **creating rules for assessing unsolicited proposals** for purely private nationally significant infrastructure projects.

²¹ Government of the Netherlands, Ministry of Infrastructure and Water Management (2018) The Dutch Multi-Year Programme for Infrastructure, Spatial Planning and Transport (MIRT) – Summary



Example: Professionalisation of the Government's role in PPPs and managing unsolicited proposals in Peru

ProlInversion (Agencia de Promoción de la Inversión Privada) is the Peruvian State agency responsible for engaging the private sector in the nation's infrastructure programme.²²

In Peru, government-sponsored projects are developed, prioritised and put forward by individual public-sector bodies across a range of infrastructure sectors, including transport, energy, irrigation and sanitation.

The ProlInversion team then bring experience and professionalism to structuring a PPP offering and taking it to market. ProlInversion also oversees a process for dealing with unsolicited proposals from the private sector. Until 2015, this had literally meant the ability to bring forward "anything, anytime". The consequence was 200 proposals, of which only three were developed and one awarded. In response, a guided process has been developed under which unsolicited proposals must meet outcomes defined by the Peruvian Government and then be submitted within a 90-day window. A chosen solution is then reopened to the market to ensure that the government is not held to ransom on price.

(iv) Data to support decision-making

High-quality, up-to-date data – and the ability to interpret it – is the bedrock of a credible national needs assessment and infrastructure strategy. Whoever is tasked with producing the vision and plan will need access to data on the condition and performance of infrastructure. They will also need sound data on the drivers that will affect the future demand for infrastructure services. As the process moves into the implementation phase, real-time, or at least right-time, data can also support the adaptability of the strategy, alerting government and stakeholders to when risks and opportunities are crystallising.

Securing access to this data from infrastructure owners and operators can be a challenge. Governments need to be able to define the basic level of data needed across all networks. They may also need to legislate or regulate to ensure it is made available.

At the level of the national infrastructure system, interoperability of data is a huge challenge but opens up the prospect of being able to model the impact of interventions at the system-of-systems level. This will guide the extent to which the data generated by different assets across different networks with different owners using different systems can be exchanged and analysed.

Failure to get on top of the data challenge will damage the credibility of the strategy, and is likely to lead to poor prioritisation of investments and of the other elements of a government's package of interventions.

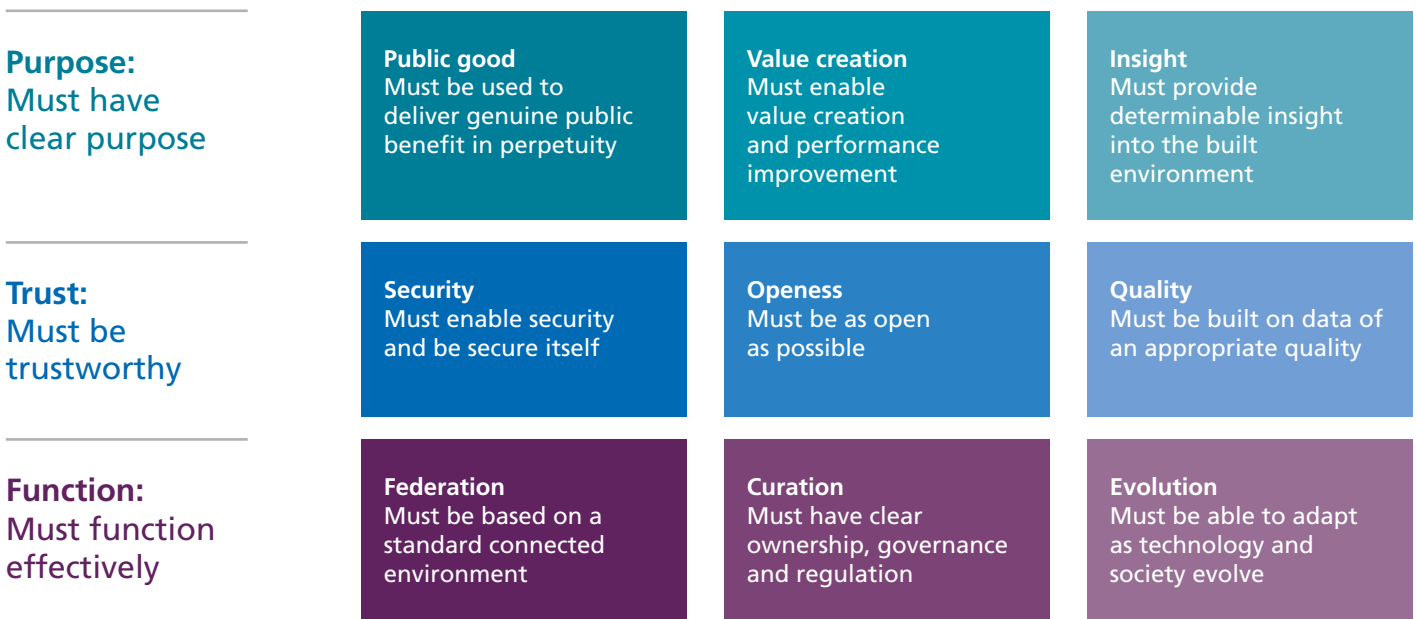
What should be included?

Governments should focus on:

- **securing access to data and developing the capability to use it**, ensuring that bodies charged with creating the national vision, needs assessment, infrastructure strategy and project prioritisation can access high-quality *right-time* information and have the capability to transform it into usable insights
- **driving interoperability of infrastructure data** by facilitating the creation of standards for its collection, tagging, management and sharing
- **auditing and verification of data quality**, establishing clear responsibility and accountability for this task
- **ownership, privacy and security issues**, identifying and resolving any issues around data ownership, privacy and security that create barriers to its exploitation by both public bodies and developers of innovative products and services.

²² ProlInversion (Agencia de Promoción de la Inversión Privada)

Figure 8: The Gemini Principles



Example: Supporting interoperability – The Gemini Principles

Modern infrastructure generates huge amounts of information that can be used to improve planning and optimise services. Even more value can be unlocked if data relating to sets of individual assets (their digital twins) is interoperable and comparable. This idea of infrastructure as a cyber-physical system, in which physical and digital assets combine, underpins the concept of a national or city-wide digital twin. If delivered, it will be a powerful tool to help strategic planners analyse the cross-sectoral impacts of different options and interventions in infrastructure systems.

A 2017 report by Deloitte for the UK’s NIC²³ found that greater data sharing could release an additional GBP 7 billion of benefits across the UK’s infrastructure, equivalent to 25% of current annual spending on its networks. These benefits will not be realised, however, unless different asset owners and their advisers develop wholly different methodologies and platforms for collecting, tagging, managing and exchanging data.

The NIC subsequently asked the Centre for Digital Built Britain to develop a set of principles that could be used to underpin an information management framework that could ensure that data making up a network of digital twins is functional, trustworthy and useful. These Gemini Principles were published in 2018,²⁴ and are being used as a basis for discussion among UK stakeholders to establish the *kind of data commons* needed to unlock the benefits of interoperability.

If different asset owners and their advisors develop wholly different methodologies and platforms for collecting, tagging, managing and exchanging data these benefits will not be realised.

The Commission subsequently asked the Centre for Digital Built Britain to develop a set of principles that can be used to underpin an information management framework that can ensure data making up a network of digital twins is functional, trustworthy and useful. These Gemini Principles were published in 2018²⁵ and are being used as a basis for discussion amongst UK stakeholders to establish the kind of data commons needed to unlock the benefits of interoperability.

23 Deloitte (2017) New Technologies Case Study: Data Sharing in Infrastructure – A final report for the National Infrastructure Commission
24 Centre for Digital Built Britain (2018) The Gemini Principles

(v) Stakeholder engagement

Why is it important?

Effective stakeholder consultation provides vital data and information to support needs assessment, strategy creation and project prioritisation. At the project level, timely and open-minded consultation allows modifications to be made in the early stages of a project, avoiding costly legal challenges or late and costly changes to scope.

Consultation also builds public confidence and supports the establishment of greater consensus, or at least acceptance of decisions made about infrastructure.

What should be included?

Governments should focus on:

- **establishing responsibility and accountability for stakeholder engagement**, including considering the benefits of tasking an independent body with this role and how the quality of the process will be audited
- **establishing proactive stakeholder engagement processes** that are open, engage all relevant stakeholder groups and are widely accepted as being fair
- **understanding the different stakeholder engagement techniques** needed to support needs assessment and strategic planning, as well as specific infrastructure projects.



Example: Effective early stakeholder consultation – France’s Commission Nationale du Débat Public (CNDP) and Flamanville 3 nuclear power plant

The CNDP is an independent body that is responsible for securing “public participation in the decision-making processes of major infrastructure projects of national interest”.

Once a project is declared nationally significant by the French government the CNDP conducts a consultation exercise as part of the early-feasibility stage of the project. The CNDP can set up its own commission to manage the process, or ask the developer to manage a public debate, with the CNDP taking an oversight role.

The debate process involves a wide-scale public consultation involving public meetings, online information and written publicity. At the end of this period the CNDP publishes feedback on the project, capturing key messages from the debate. The developer must respond within three months, explaining how it will proceed. While the CNDP’s report holds no legal status the CNDP itself has significant influence and can undertake a monitoring approach to help ensure commitments are followed through in the consenting process.

The Flamanville 3 nuclear power plant in northern France is an example of how the CNDP can front-load consultation at the

early stage of a project, before changes become difficult and costly to make.

EDF, the plant’s sponsor, decided to seek consent for a third reactor at the site in October 2004. By March 2005, CNDP had appointed a commission and had instigated a national debate that ran from October 2005 to February 2006, prior to the public inquiry that ran from May to August 2006. Consent was granted in April 2007.

According to a study by the UK’s NIC,²⁵ EDF recognised the positive contribution the debate made to the project design process, noting that it resulted in constructive ideas to upgrade the project and improve its acceptability to the public. These ideas included a stand-alone study to examine the risks of aircraft crashing into the nuclear reactor (the inquiry took place four years after the 9/11 attacks in the USA) and a process of independent expert scrutiny of confidential documents that EDF had not been able to release to the public.

The NIC study also concluded that the CNDP process reduced the time spent on the subsequent full public inquiry and the final approval stages of the process.

Example: Human capacity-building – Nepal

Following the devastating 2015 earthquake, Nepal had to embark upon a major programme of renovation and rebuilding. UNOPS, in collaboration with Nepal Police and the UK Department for International Development, deployed the CAT-I tool (set out on page 24) to help plan a way forward. A key action area identified was building the human resource capacity within the partner Ministry. To deliver on this objective, the following actions were identified:

- clarification of the roles and responsibilities of the departments and key staff
- creation of a human resources plan based on a review of the Federal Police Bill
- increase the number of key staff positions based on established staffing benchmarks and required technical input at key stages of the infrastructure lifecycle
- creation of a career development initiative and training plan within the Ministry in partnership with the Administrative Staff College.

²⁵ National Infrastructure Commission (2017) International Infrastructure Governance Report

(v) Human capability

Why is this important?

The task of conducting needs assessments, developing infrastructure strategies, prioritising projects and taking them to market all require specialist skills. Governments need to be able to access these skills, either from within the domestic civil service or in partnership with industry, academia and NGOs.

What should be included?

Government should focus on:

- **skills audits** to identify any gaps in their capability and those of its private-sector partners
- **developing career paths** with appropriate prestige and financial rewards to attract ambitious officials and private-sector expertise
- **partnering with academia and professional institutions** to develop programmes to improve public- and private-sector capabilities.

Example: Driving a step change in the enabling environment – United Arab Emirates (UAE) Ministry of Infrastructure Development (MOID) Strategic Plan 2017–2021

Unlike the other national infrastructure strategies discussed in this report, the focus of the UAE's strategic plan²⁶ is not identifying a pipeline of priority projects but rather delivering a significant improvement to the enabling environment.

It is built around five strategic goals aimed at securing improvements to:

- sustainability and asset management
- project management and execution
- requirements and design
- planning and development
- governance and decision empowerment

The initiatives that sit under each of the strategic goals are a mix of policy and other interventions. For example:

- Goal 1: *Ensure integration and comprehensiveness in planning and implementation of infrastructure projects* is supported by initiatives including the establishment of a future foresight system, new laws, codes and standards to encourage private-sector participation in projects and the creation of a national infrastructure masterplan
- Goal 2: *Manage federal infrastructure projects to achieve balanced and sustainable development.* This includes the development of system

for project innovation management, the launch of a sustainability leadership programme and greater use of 'smart solutions' to speed up project delivery

- Goal 3: *Enhance the efficiency and effectiveness of federal infrastructure assets to maintain stability.* This is backed by programmes to develop a federal asset management system, a research programme to improve the efficiency of existing assets and the development of a national disaster management and business continuity plan
- Goal 4: *Ensure that all administrative services are provided in accordance with quality, efficiency and transparency standards.* This commits the UAE to adopt best practice in human resources, procurement, financial management, quality management and leadership
- Goal 5: *Enrich the work environment with innovation culture.* This aims to support employee capability-building via training, partnerships with universities and support to engage with international conferences and networks. It also looks to put in place the management systems to support the adoption of innovation and create incentives for individuals to bring forward new ideas.

Image Captions:

Cover and Page 31: Dubai metro trains crossing each other near Dubai Airport metro station, United Arab Emirates.

Page 3: Woman wearing a yellow top, standing on moving escalator, Vienna Austria.

Page 5: An auto rickshaw being ridden in India.

Page 6-7: Silhouette of high voltage electric towers in Thailand.

Page 8: Subway station with a train passing by in Germany.

Page 9: Busy street scene, Manhattan, New York, United States of America.

Page 10: Paris metro station, during rush hour.

Page 13: Skyline photo showing railroad track, Kuala Lumpur, Malaysia.

Page 18-19: Curaçao island, West Indies, Dutch Caribbean.

Page 21: Friends jogging across a bridge in the Park, Australia.

Page 22: Aerial view of Brisbane CBD, Roma Street Train Station and South Brisbane, Queensland, Australia.

Page 23: Aerial view of road junction in Shanghai, China.

Page 24: Man looking at mobile phone on a bike, Beijing, China.

Page 26: Panorama of Lima, Peru. The fifth largest city in Latin America.

Page 28: Crowded shopping street at Thamel Market, Kathmandu, Nepal.

Summary

This report draws together key resources from around the globe that describe some of the most effective approaches to prioritising and planning infrastructure networks. In addition, it offers insights into how to develop the right enabling framework to ensure the successful delivery of national infrastructure strategies. Both are critically important for any economy to deliver the high-performing infrastructure networks that benefit businesses and society. The report also sets out 12 guiding principles to help decision-makers achieve these outcomes.

²⁶ UAE Ministry of Infrastructure Development (MOID) Strategic Plan 2017-2021





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Enabling Better Infrastructure: 12 guiding principles for prioritising and planning infrastructure



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