

Industry Agenda

Strategic Infrastructure

Steps to Prioritize and Deliver Infrastructure Effectively and Efficiently

With Appendices

Prepared in collaboration with PwC

September 2012



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Foreword

Foreword by the World Economic Forum

Strategic infrastructure is the backbone that interconnects our modern economies. The most strategic investments are functional and create the greatest impact in terms of economic growth, social uplift and sustainability. It is generally assumed that for every dollar spent on public infrastructure investment the gross domestic product of the country will increase by approximately US\$ 0.05 to US\$ 0.25. Thus, competitive economic advantage clearly depends on a country's infrastructure vision and long-term planning; yet, there is no succinct manual available to help government leaders in selecting and prioritizing their infrastructure needs beyond the constraining logic of political cycles. In fact, infrastructure will only drive sustained economic growth when it is properly aligned with the country's priorities. In other words, it is an imperative that presidents, prime ministers and civil servants must inscribe at the topmost position of their countries' agendas to successfully convert their strategies into action.

The World Economic Forum's Strategic Infrastructure Initiative is a collaborative reflection of the steps required to effectively and efficiently deliver economic infrastructure projects by focusing on two basic questions: how can governments prioritize the key infrastructure projects that provide the optimal social and economic benefit for their countries; and once these projects are identified, how can stakeholders work together to accelerate the implementation of these projects most effectively and efficiently? This Report focuses on the first question and provides practical guidance, including - but not restricted to - an actionable framework and a perceptual, multidimensional tool that can be used to engage a cross section of stakeholders interested and involved in planning infrastructure projects. Without going into detail about how to accelerate project implementation, the Report also suggests ways that governments can deliver infrastructure more effectively and efficiently by choosing the right procurement approaches, utilizing new technological and design solutions, optimizing the cost of finance, and using best practice project management methodologies to oversee the procurement, construction and operational phases of projects.

This Report and the accompanying knowledge cards aspire to bring clarity to the national economic planning exercise using simple - but powerful - tools of thought, methodologies, and concrete examples that government leaders can own to successfully deliver their infrastructure projects. In particular we hope that the infrastructure knowledge cards can be used as a series of "*trump cards*" to keep government leaders ahead of the economic planning game.

This Report lays the foundation for the next phase of the Strategic Infrastructure Initiative, where the focus will be on the second core question of the initiative: how to accelerate the implementation of priority infrastructure projects in the most effective and efficient manner? Our work in this Report has identified that a key challenge to date is the lack of effective project preparation facilities. The next phase of our Strategic Infrastructure Initiative work will recommend solutions to this.

This Report is a direct result of a cooperative process with leaders from government, civil society and the private sector, particularly the engineering and construction, financial services and investors industries. In this regard, we would like to thank and acknowledge the World Economic Forum partner companies that served on the Strategic Infrastructure Steering Board: ABB; Alcoa; Amec; Arup; Bilfinger Berger; CH2M HILL; CVC Capital; Fluor Corporation; GE; Hindustan Construction Company; Leighton Holdings; Petrofac; Prudential; Punj Lloyd; SNC-Lavalin International; and Welspun Corporation.

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Key also has been the keen interest of the Governments of Colombia and Panama who provided real platforms for early discussion and testing of a number of ideas and tools presented here.

Finally, we would like to give special acknowledgement to the leadership and commitment provided by Gordon Brown (Prime Minister of the United Kingdom 2007-2010 and Chair of World Economic Forum Global Issues Group), Tidjane Thiam (Group Chief Executive, Prudential and Chair of the Cannes G20 High-Level Panel on Infrastructure and Cannes B20 Task Force on Infrastructure Development), Klaus Kleinfeld (Chief Executive Officer, Alcoa), and Donald Kaberuka (President, African Development Bank) for their genuine, relentless interest and commitment to the Strategic Infrastructure Initiative. Their experience, perspective and guidance has substantially contributed to a number of remarkable discussions with particular highlights at the World Economic Forum Annual Meeting in January 2012 and the World Economic Forum on Africa in May 2012.

Alex Wong

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Foreword by the International Finance Corporation

Throughout the developing world, large numbers of people lack access to the essential benefits that infrastructure provides—electric power, clean water, modern telecommunications, and safe and reliable transportation.

These deficiencies are an impediment to higher living standards, and a significant obstacle to economic development. They prevent private enterprises from succeeding and growing in ways that allow them to create jobs and reduce poverty. In a time of scarce resources, it will take careful decision-making to overcome them—specifically on how best to allocate financing for infrastructure.

Public sector efforts to reduce the gap in infrastructure financing will be critical, but scarcely sufficient. The private sector also has an essential role to play. It can bring in much-needed capital, expertise, and efficiency to help fill the gap. It can bring an entrepreneurial, results-driven approach to infrastructure—one that complements the work of governments.

As the largest global development institution focused on the private sector, IFC knows that from experience. For more than 50 years, we have worked in some of the most challenging emerging markets to help the private sector create opportunity, improve lives and reduce poverty. We have found that market-based solutions—particularly when aligned with the work of governments—can expand the availability of essential services at affordable rates. Public-Private Partnerships can improve the quality of life in local communities in measurable ways.

This is essential work. It can also be time-consuming and complex, especially in less-developed economies. Our experience has shown that collaboration within the World Bank Group and partnerships with other multilateral development banks, international institutions and donors help facilitate a coherent approach to infrastructure development that typically brings stronger and lasting results.

Our work in Africa offers a clear example of this. In the fiscal year that ended June 30, 2012, IFC invested a record of about US\$ 1.6 billion in infrastructure and natural resources projects in the region, including funds mobilized from others. That is more than double the number in the previous fiscal year. These projects helped generate more than US\$ 5 billion in investment flows into Africa.

Better governance, higher commodity prices and increased foreign investments have facilitated greater infrastructure investment in Africa. Infrastructure development, in turn, has accounted for about half of the recent increase in the continent's economic growth, research shows.

Much more can be done—not only in Africa but across the developing world. Political risks, weak governance, and limited regulatory capacity remain formidable obstacles. Across the globe, public sector budgets are shrinking. Such conditions heighten the need for innovative thinking. For these reasons, we welcome the work that the World Economic Forum conducted under its Strategic Infrastructure Initiative, which resulted in this Report.

The Report proposes a comprehensive framework for selecting and prioritizing infrastructure projects in any given country that builds on the knowledge of all relevant stakeholders. This framework can bring significant results in terms of economic growth, in a socially and environmentally sustainable way. The correct prioritization of projects, of course, is only a first step and this report goes on to explain how infrastructure projects can be delivered more effectively and efficiently. The next phase of the Strategic Infrastructure Initiative will focus on the project preparation acceleration process and innovative financing models.

We look forward to continuing our engagement on this important initiative—with the World Economic Forum, and with the members of the Strategic Infrastructure Initiative Steering and Advisory Committees.

Rashad Kaldany

Acting Chief Executive Officer and Executive Vice-President,
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Executive Summary

Objectives

Infrastructure investment, whether it is maintaining existing networks or building new assets, is critical to economic progress. Most countries are not investing enough, which is hampering their growth prospects and deferring an ever increasing burden to the years ahead. How should projects be prioritized? Is there a role for the private sector alongside government? Where will the money come from? How can international interest be attracted?

Infrastructure only drives economic growth when it is well aligned with the country's economic, industrial, social and environmental priorities. To maximize the benefits from selected economic infrastructure it is essential that governments address two fundamental questions:

- how should governments prioritize which economic infrastructure projects create the greatest impact in terms of economic growth, social uplift and sustainability?
- once prioritized, what should governments do to help ensure the projects are delivered effectively and efficiently?

The purpose of this Report is to suggest ways in which these questions can be answered.

Audience

Even if infrastructure is privately owned and provided, national governments must decide priorities, facilitate land acquisitions and create an appropriate enabling environment. Because high barriers to entry limit competition, governments must also develop contractual or regulatory frameworks. Thus, most decisions concerning big infrastructure priorities inevitably lie with national governments. This Report is therefore designed principally for senior government leaders and officials responsible for planning and delivering infrastructure. Other stakeholders, including the private sector (construction and operating companies, financiers and others), the multilateral development bank and donor community, and civil society should also benefit from the formulation of this “*common language*” on infrastructure to facilitate a more productive engagement with government.

Scope

This Report is intended to be a “*road map*” to steer governments and key stakeholders to best practices by providing an actionable framework and case studies.

The frameworks and methodologies have deliberately been kept generic so that the principles can be applied in emerging and developed economies. For this reason, the report focuses on economic infrastructure, that is, infrastructure that generates growth and enables society to function. Examples include transport facilities (air, sea and land), utilities (water distribution networks, gas pipelines, electricity grids and electrical power generation), flood defences, waste management and telecommunications networks.

Structure

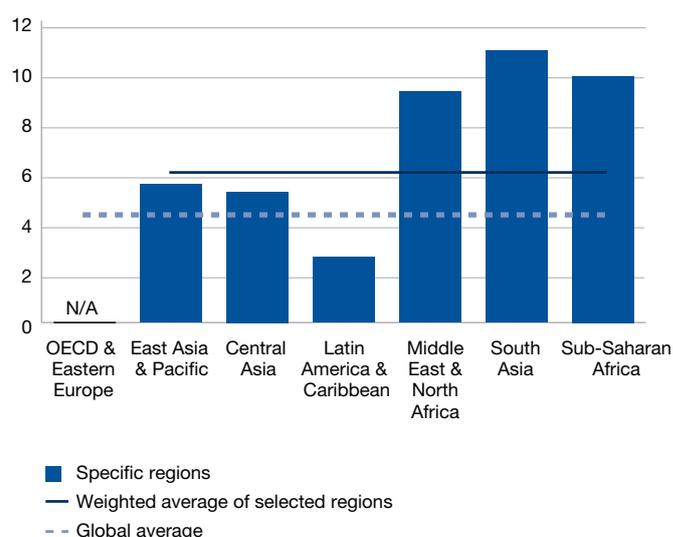
The Report begins with a discussion on why economic infrastructure is required and provides context on the amount countries should be investing in infrastructure.

Numerous economic studies conclude that over the medium to longer term, well-planned investment can play a central role in improving competitiveness and economic growth. It is estimated that a dollar spent on infrastructure generates an economic return of between 5%-25%.

As well as contributing to economic growth, infrastructure investment can bring social benefits, such as improving access to services for remote communities and better health outcomes. Properly planned infrastructure can also reduce the environmental impacts of growth.

Graphic 1 illustrates the proportion of gross domestic product (GDP) that economies need to invest in economic infrastructure (both to build new infrastructure and maintain existing assets) to enable prolonged economic growth.

Graphic 1: Annual Infrastructure Investment and Maintenance Needs (% GDP)



Sources: Global average based on the figure in Appendix 2 and the figures for the specific regions are based on African Development Bank, Asian Development Bank, et al. *Supporting Infrastructure Development in Low- Income Countries: Submission to the G20 by the MDB Working Group on Infrastructure. Interim Report. June 2011, p. 2.*

Most countries' actual investment is well below these levels, with the global infrastructure gap (the difference between investment needs and actual spending) estimated at about US\$ 1 trillion (1.25% of global GDP).

To address the infrastructure gap and secure the benefits that well-planned functional infrastructure can generate, there is a need for governments to increase the amount they invest into infrastructure and for more infrastructure to be paid for by users.

As many governments are under tight fiscal constraints, additional government investment is often difficult. It is therefore crucial that investments are strategic in nature to maximize value for money for the taxpayer and society as a whole. Further, when governments consider strategic infrastructure options, often the most benefit can be achieved not by building new infrastructure but by undertaking targeted improvements. For example, every dollar spent on regular road maintenance can save more than US\$ 5 on refurbishing or rebuilding a road. Therefore, governments should not only concentrate on large new projects. Priority can also be given to demand management techniques that increase the utilization of infrastructure assets. Congestion charging, for example, can reduce peak-hour traffic jams as well as raise money for municipalities.

Part A of the Report explores how to prepare a plan to prioritize the best projects and Part B explores how governments can deliver government-funded infrastructure more efficiently and effectively.

Part A: How Should Governments Prioritize Economic Infrastructure Projects?

It is recommended that governments should prepare a national economic infrastructure plan to optimize their portfolio of infrastructure investments. This will allow governments to identify interrelationships between sectors, decide which “quick wins” should be prioritized, and see more clearly where the opportunities to increase the provision of infrastructure funded from users lie.

Infrastructure is rarely under the remit of one government department. When preparing a plan, it is therefore useful to set up a central Infrastructure Unit, ideally under the supervision of the prime minister or president, to develop and execute the plan.

Investing the time and resources early to ensure that the Unit is appropriately staffed and that projects create the maximum impact will be money well spent. The Unit should contain experts with economic and financial skills, individuals from technical and engineering backgrounds, staff with leadership and consultative skills and employees who can consider the “bigger picture” and see opportunities for greater interlinkages between infrastructure networks.

Countries are, of course, of different sizes, at different stages of economic development and have different political priorities. Nevertheless, as more and more countries publish infrastructure plans, the key stages in the process are becoming clearer:

- understanding the current infrastructure situation
- formulating a long-term vision and medium-term goals
- preparing a list of infrastructure deficiencies that need to be rectified and identifying potential solutions to address these deficiencies
- deciding which potential solutions create the greatest impact in terms of economic growth, while also considering social and environmental issues
- deciding who should pay for the infrastructure – users or taxpayers
- finalizing the prioritization of projects based on available cash resources
- moving from planning to action - publishing and marketing the plan, ensuring that the necessary policy changes are enacted and, for the selected projects, finalizing the detailed project preparation process so that value for money “bankable” projects can be tendered.

Each of these is addressed below:

Stage 1 – Understanding the Current Situation

To better understand the condition of infrastructure assets and the barriers to further investment, the World Economic Forum has developed a framework to help governments familiarize themselves with the main drivers of infrastructure investment – the **Strategic Infrastructure Planner Framework**. This framework, illustrated in Graphic 2, covers the four drivers of infrastructure readiness: the condition of infrastructure assets in the country; whether government policies and actions are conducive to infrastructure investment; whether there is support from wider society to invest in infrastructure and engage in debate; and whether there is a competitive construction industry that can easily access labour, building materials and finance.

Graphic 2: Strategic Infrastructure Planner Framework – 14-prioritized Economic Infrastructure Readiness Parameters



Against each of the 14 parameters, governments should collect as much information as required about the condition of economic infrastructure (whether publically or privately owned) and the threshold/capacity levels for infrastructure to be functional from surveys, available databases and metrics held within different government departments.

Beyond basic metrics, many countries do not have comprehensive asset registers and creating them would take a long time. Nevertheless, a useful snapshot of the situation can be obtained by consulting representative stakeholders drawn from public-sector organizations, private companies, financiers, civil society, academia and NGOs, as well as overseas investors and contractors. Using the **Strategic Infrastructure Planner Framework** the World Economic Forum has developed a perceptual tool to help governments gather this information from stakeholders in an engaging and inclusive way – the **Strategic Infrastructure Planner Tool**.

Early stakeholder engagement is also recommended as a way to highlight and address contentious issues from the start, which should result in projects being delivered more effectively and efficiently once “in principle” approval is given.

Stage 2 – Creating a Vision and Goals for the Future

Most infrastructure assets last for many decades, so governments should start by defining what the infrastructure vision should be over the long term, e.g. the next 50 years.

Although final prioritization decisions rest firmly with government, stakeholders should also be invited to give their views and perceptions of the long-term vision and requirements.

With the infrastructure vision drafted, a subset of outcome-based, medium-term infrastructure goals can then be prepared for the next 10 years that will go some way towards delivering the longer-term vision.

Stage 3 – Using the Infrastructure Goals to Identify Possible Projects

Against the list of outcome-based goals, governments should judge which infrastructure deficiencies need to be addressed over the next few years. For each issue governments should consider a number of possible solutions that go some way towards meeting the infrastructure goals, remembering also to assess cheaper solutions; for example, improved maintenance or selective upgrades at key bottlenecks.

Stage 4 – Finalizing the Best Solution for Each Infrastructure Deficiency

Cost benefit analysis is a well-accepted methodology to achieve a consistent and effective prioritization of projects. Rather than having interest groups, including government departments, lobbying for projects with uncertain impacts, cost benefit analysis gives governments objective criteria with which to evaluate options. The methodology also encourages the use of sensitivity analysis to assess the robustness of assumptions and determine the key cost drivers. This can be used to help reduce the risk of cost overruns, time overruns and subsequent problems during the operational period of infrastructure.

However, despite its benefits there are instances when governments decide on a preferred solution and then formulate a cost benefit analysis to give the response they want. Therefore, as well as adopting best practices and presenting results in a transparent way, governments should use independent forecasts to reduce the risk of optimism bias. For if potential investors and participants in projects can see evidence of a credible cost benefit analysis their confidence and willingness to consider tendering will be increased.

Stage 5 – Deciding Who Should Pay for Infrastructure

Some infrastructure can only be effectively paid for and funded by governments, either because it is not possible to charge users, or users will not pay the full amount to cover the cost of the infrastructure.

Infrastructure that can be paid for and funded by users should be encouraged unless the investment is not aligned with the government's economic, industrial, social and environmental policies. In cases where support is needed to make projects commercial, or where there are groups of society that are no longer able to afford essential infrastructure services, subsidies can be given. This is a mixed user-pay and taxpayer-funding solution.

Stage 6 – Finalizing the Plan

By promoting all the infrastructure projects that can be paid for with user charges, governments should focus on those non-commercial projects that create the greatest impact in terms of economic growth, social uplift and sustainability, i.e. those that have the highest benefit/cost ratios. Because of affordability constraints and government budgeting cycles, some projects that would be beneficial to society will not be able to be funded due to a lack of resources. In short, not all projects with good benefit/cost ratios can be pursued. However, government budget cycles should be lengthened beyond one year so at least more expensive projects can be pursued if these offer society the highest benefit/cost ratios.

With an approved pipeline of prioritized projects, governments can then start addressing practical delivery questions with the confidence that the projects will proceed. For example, master plans can be prepared as a way to visualize building programmes, and steps can be taken to start securing land use planning approvals and acquire necessary land parcels.

Stage 7 – Moving From Planning to Action

The creation of an overall plan will involve difficult decisions, including pursuing new projects that are controversial to some people and delaying or cancelling some projects because of affordability constraints or poor benefit/cost ratios. The infrastructure plan will therefore require careful marketing, both to internally within government and to the wider stakeholder community.

Government policies may need to be changed so the plan can be delivered. Resources and expertise will also be required to finalize commercial structures and undertake more detailed cost and demand estimates so the government can tender "bankable" projects to the market. This project preparation phase can cost from 2%-4% or more of the total capital cost of a project, and is one of the main reasons why even prioritized projects sometimes get delayed or cancelled.

Part B: Once Governments Have Prioritized Investments, What Should They do to Help Ensure the Projects are Delivered Effectively and Efficiently?

The outcome from the infrastructure plan should be a list of projects that will be commissioned over the next few years and related steps to facilitate their delivery. Part B of the Report focuses only on infrastructure projects that require government support and funding, rather than projects that are wholly or predominantly user-funded. It covers the five main ways that governments can maximize the value for money for their taxpayers: choosing the best procurement routes; using technology to reduce the cost of projects; looking for ways to maximize the efficiency of finance; improving the project management capability of government departments; and dealing with challenges once infrastructure projects start getting built and becoming operational.

Each of these opportunities is discussed below:

1. Value for Money Procurement of Government-funded Infrastructure

Beyond building and operating infrastructure with public works teams, three main procurement options exist, notably traditional procurement, design and build contracts and whole lifecycle costing solutions. Nevertheless, numerous permutations are possible.

With the traditional procurement approach governments design infrastructure assets and then normally tender out the construction works to the contractor who has the cheapest price. This approach limits the scope for innovation.

Design and build contracts require private-sector contractors to tender for designing and building the infrastructure, which can result in innovative solutions being proposed that may reduce the cost of construction or improve the long-term performance of the assets. There are standard design build contracts, where some risks may be shared between the public and private sector, and engineering procurement and construction (EPC) contracts, which are commonly fixed-price contracts, but other variants exist.

Despite some contractors preparing proposals that require little subsequent maintenance or are of a higher quality, bidders are often selected on the basis of the cheapest construction price. If government instead evaluated the whole lifecycle cost of assets, it might well discover that some of the more expensive bids represent better value for money over the whole life of the project (total cost of ownership).

To achieve the benefits of whole lifecycle costing, the government can either incentivize public works departments to optimize the whole lifecycle costs in the design, building and maintenance of assets, or it can invite the private sector to build and operate assets with long-term contracts. Public-private partnership (PPP) models are one option. The World Bank defines a PPP as “a long-term contract between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility”.

2. Utilizing Technology in Government-funded Infrastructure

Technological advances happen so quickly that to adequately explain different construction technologies is beyond the scope of this report. Nevertheless, technology includes the use of new construction materials and prefabricated components, and adopting innovative design techniques to minimize disruption to existing infrastructure networks. Benefits can also be achieved by governments standardizing building codes as this can reduce the cost of materials and improve health and safety conditions.

3. How Should Governments Maximize the Efficiency of Finance?

For projects ultimately funded by taxpayers, another way to manage overall costs is to secure efficient sources of finance. Governments have two main options to pay for projects’ construction and operating costs:

- using their own resources, either by spending existing cash reserves, selling government assets, raising taxes or issuing government bonds to fund the investment
- with PPP approaches, using project finance solutions and paying for the assets over a number of years once they are operational.

Reducing the cost of government bond launches is possible if governments are able to present credible fiscal plans to the markets that show that monies will be used for long-term, growth-boosting capital investment rather than to cover current spending requirements.

In isolation, the cost of finance for PPP projects tends to be higher than governments’ cost of finance for two main reasons: it is generally more expensive for private parties to raise money than it is for governments; and the finance is raised for a specific project so the security for repayment will depend purely on its cash flows, requiring a premium in both debt and equity returns unless risks are allocated very carefully.

However, if private financing is brought in as part of a structure that incentivizes the right private-sector skills and provides the motivation to assess risks and manage a project closely, the higher cost of capital can often be offset by reduced costs from delays, cost overruns and problems with performance, such that the overall annual costs of PPP projects are often lower.

To maximize the efficiency of private finance, it is therefore important to structure contracts appropriately so that risks are allocated to the public or private party best able to manage them, and to create a supporting enabling environment. Other solutions are also suggested. For example, government or multilateral development bank guarantees offer a way to reduce the cost of finance, without “crowding out” private finance in the way government or multilateral development bank loans do.

4. Project Management for Government-funded Infrastructure

Private-sector companies commonly choose to adopt a single project management standard, such as those developed by the professional project management associations. Governments should also adopt a recognized standard and follow its specified processes to reduce the risk of cost overruns, scope creep and delays.

5. How Should Governments Address Challenges Once Construction and Operations Start?

Even well-designed and built infrastructure will not achieve the intended benefits unless it is maintained. If the government uses traditional or design-build procurement approaches, it must ensure that sufficient funds are set aside for routine maintenance and that the maintenance quality is monitored. When a government chooses a PPP model, PPP funders will closely monitor performance and, through the project company, bring issues to the government’s attention in the regular update meetings they will have. These partnership meetings also give governments an opportunity to raise points it may have so that these can be resolved as quickly as possible.

The vast majority of the other construction and operational problems can be resolved with proper project management, contract structuring, contingency planning and by being flexible to changing or adapting the use of assets should circumstances change.

Conclusion

Infrastructure will drive economic growth only when it is well-aligned with the country’s economic, industrial, social and environmental priorities. Governments can adopt certain standard approaches to prepare an economic infrastructure plan that achieves this objective. A body of knowledge and experience exists that can be used to guide decisions on the prioritizing, structuring, procurement, financing and management of projects. The World Economic Forum trusts that the guidance offered in this Report is helpful to governments as a starting point and looks forward to contributing to the debate and decisions taken in this important field.

Introduction

Key points

- Infrastructure is one of the drivers of economic growth
- Due to the special characteristics of infrastructure, such as infrastructure networks crossing land owned by different parties, most decisions about national infrastructure priorities lie with central government
- The global infrastructure gap (the difference between infrastructure needs and infrastructure spending) is about US\$ 1 trillion (1.25% of global gross domestic product) a year, making infrastructure investment a pressing concern in many countries

Infrastructure is one of the drivers of sustained growth and acts as an enabler for a country's competitiveness. However, infrastructure development will not drive economic growth unless it is fully aligned with the country's economic, industrial, social and environmental priorities, and is delivered efficiently and effectively.

This section clarifies different infrastructure definitions, explains further why infrastructure is needed, gives some context about the global imbalance between infrastructure needs and actual infrastructure spending, and describes the objectives of the Report in more detail.

The principal audience for this Report are likely to be senior government leaders and the civil servants in the government departments responsible for infrastructure and national economic planning for four main reasons:

- **The capital characteristics of infrastructure.** The initial capital investment required for infrastructure networks tends to be very high in relation to its operating costs. Further, once infrastructure has been built, it is often difficult to move it another location. Thus barriers to entry are high. If infrastructure is privately owned there will be less competition, which could result in the companies charging users high prices. This explains why privately run utilities are often controlled by appropriate regulatory mechanisms.
- **Land issues.** The private sector is rarely able to build infrastructure without some government support since infrastructure networks typically cross land owned by different parties. Therefore, to facilitate investments, governments often need to compulsorily purchase land.
- **Political or technical inability to charge for infrastructure use.** It is very difficult to charge users for some types of infrastructure; for example, asking drivers to pay for the cost of maintaining and building all the roads in a city because everyone in a city benefits from its road network. Therefore, infrastructure projects in many sectors need to be prioritized, promoted and funded at least partially by governments.
- **Infrastructure projects may not be commercial but may be worthwhile from society's point of view.** These economic, social and environmental reasons are explained below.

Therefore, most decisions about national infrastructure priorities inevitably lie with central government, whether they directly invest in the infrastructure or provide the enabling regulations to stimulate private investment.

This Report and the frameworks developed are also relevant for infrastructure planning in cities, local regions and international blocs (such as Mercosur and the European Union). For example, the frameworks suggested for prioritization are relevant for the work the Cannes G20 High-Level Panel on Infrastructure prepared, where 11 exemplary pan-regional projects were identified. There are illustrated in Figure 30 in Appendix 1. The frameworks suggested are also relevant for Multilateral Development Banks (**MDBs**) and others, such as the Program for Infrastructure Development in Africa (**PIDA**).¹ PIDA has been developed by the African Union Commission over the past three years in partnership with the United Nations Economic Commission for Africa, the African Development Bank and the New Partnership for African Development (**NEPAD**), and has identified 51 African infrastructure projects with a total capital value of about US\$ 68 **billion**.

This document should also be useful for other stakeholders, including the private sector (construction and operating companies, financiers and others), the MDB and donor community, and civil society who should benefit from the formulation of this "*common language*" on infrastructure to facilitate a more productive engagement with government.

A deliberate decision has been made to keep the frameworks and methodologies generic so the principles can be applied in emerging and developed economies.

Definition of Infrastructure

No standard definition of infrastructure exists. However, most agree there are three types that overlap:

- **Economic infrastructure:** projects that generate economic growth and enable society to function. Examples include transport facilities (air, sea and land), utilities (water, gas and electricity), flood defences, waste management and telecommunications networks. For the purposes of this Report, power plants are also included in the definition of economic infrastructure
- **Social infrastructure:** assets to support the provision of public services. Examples include social housing, health facilities, educational establishments and green infrastructure (multifunctional green space within and between urban areas, such as parks, gardens and green corridors, that enhances social livelihoods and encourages biodiversity)
- **Soft infrastructure:** the public institutions required to maintain society. Examples include both central government buildings and laws, rules and systems that are created to upkeep law and order, improve educational attainment and address public health issues.

There is sometimes discussion about **industrial infrastructure**; for example, the infrastructure required in mines or the interconnecting roads within a large factory complex. However, this Report would classify this as **industrial investment** rather than use the term infrastructure. Box 1 provides further analysis of ways to define and compartmentalize infrastructure.

Box 1: Further Ways to Define Infrastructure

To provide additional granularity, **economic, social** and **soft infrastructure** can be further subdivided into:

a) Is the infrastructure functional or not?

Functional infrastructure is infrastructure that works and satisfies the demand. Examples include electricity grids that can cope with peak demand and motorways that are rarely congested. Due to **interdependencies** between different infrastructure assets, infrastructure that is not **functional** often affects the functionality of other infrastructure networks. For example, if an airport link road is being rebuilt, not only is the link road not **functional** but so is the airport.

b) Is the infrastructure strategic or not?

Strategic infrastructure investments are **functional** projects that create the greatest impact in terms of economic growth, social uplift and sustainability, i.e. they deliver the highest societal benefit. They can be split into two types:

- **Critical infrastructure** is essential to support the socio-economic development of an economy. Examples include flood barriers, power generation and mass transit. Countries at different stages of economic development have different definitions of what is “*too important to fail*”. For example, an electricity supply with very infrequent power outages may be regarded as critical in many developed countries, while many emerging economies deal with such challenges daily.
- Projects that are not **critical**, yet spur economic growth or address key environmental and social objectives. These are often called “*projects of national importance*”. For example, a government may believe it necessary to reduce dependency on fossil fuels and may encourage investment in renewable energy supplies. Or the government may see strengthening the broadband network in rural areas as key to stimulating rural economic growth.



Issues to deliberate when prioritizing and delivering **social** and **soft infrastructure** depend greatly on the political system in a country. This raises issues of more general applicability. This Report therefore focuses only on **economic infrastructure**.

Why is economic infrastructure required?

Before considering the subset of **strategic economic infrastructure** it is important to understand why **economic infrastructure** is needed. The answer is for three main reasons:

- For economic growth. Most economic studies conclude that over the medium to longer term, well-planned **economic infrastructure** investment plays a central role in improving competitiveness and leads to economic growth above and beyond the initial stimulus, as explained in Box 2.

Box 2: Research on the Links Between Infrastructure Expenditure and Economic Growth

Much research exists on whether a boost to infrastructure investment can increase national output. The general consensus appears to be that a boost to public **economic infrastructure** networks does increase economic growth, with every dollar spent on public **economic infrastructure** further increasing national **gross domestic product (GDP)** by between US\$ 0.05 and US\$ 0.40, with most estimates suggesting the lower range of US\$ 0.05 to US\$ 0.25. This is the same as saying most projects generate an economic return between 5%-25%.²

For example, research by the Conference Board of Canada states that an additional dollar spent on infrastructure increases national GDP by a further CA\$ 0.11.³

However, economic research in Organisation for Economic Co-operation and Development (**OECD**) countries between 1960 and 2005 illustrates that approximately 20% of investments in roads, railways, motorways, electricity grids and telephone networks actually produce fewer net benefits than the initial stimulus.⁴ These include instances where the infrastructure was not **functional**, such as a new motorway that is virtually empty most of the time. Alternatively, over-specified infrastructure means monies would have been better invested elsewhere, for example to improve the quality of educational systems or lower taxes.

The conclusion therefore is that some **economic infrastructure** investment does not increase growth beyond the initial stimulus – i.e. some **economic infrastructure** is not strategic. Examples include “*roads to nowhere*”, prestige investments that are over-specified and projects that are cancelled during construction. An example is the Bangkok Elevated Road and Train system that achieved financial closure in 1990 but was cancelled in 1997 after US\$ 857 million had been spent.⁵

Investors frequently cite the poor quality of **economic infrastructure** as a reason why companies' investment projects are abandoned.⁶ For example, building a road enables people and goods to travel more quickly and increases productivity as less time is spent idling in traffic. This promotes international trade, allows countries to benefit from growth in neighbouring countries and enables companies to hold lower stocks of materials, further improving competitiveness. Another example is an energy network with no or few power outages that reduces the need for some companies to install expensive back-up generators.

Therefore, if **economic infrastructure** is well-conceived, links into the government's economic and industrial policies and is delivered effectively, economic growth prospects are enhanced. This is particularly true in emerging economies.

- For social impact. **Economic infrastructure** can also improve society in many ways:
 - transport networks allow individuals to access a wider pool of job opportunities and can reduce the prices of products bought in shops, helping to reduce poverty and inequality
 - connecting households to electricity supplies leads to better educational attainment (as students can study into the evening) and improved nutrition (as fridges preserve food for longer)
 - safer water supplies lessen the spread of waterborne diseases and improve health equality
 - access to telephones and mobile phones makes it easier for people to communicate and undertake business.

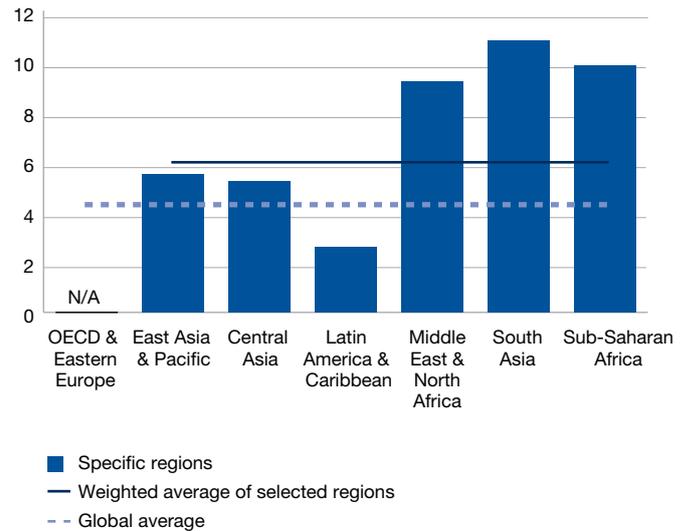
- For sustainability and environmental impacts. New **economic infrastructure** is often seen as having a damaging effect on the environment, with increased pollution, the overuse of water resources, negative visual impacts and loss of land. However, **strategic economic infrastructure** need not damage the environment and can actually address certain environmental issues. Examples include:
 - environmental laws and regulations that improve the quality of infrastructure; for example European Union water quality standards
 - strengthening electricity grids in areas with new renewable energy opportunities, helping to broaden the energy base and deliver a more sustainable energy supply mix
 - supporting road enhancements that reduce congestion, decreasing pollution and fuel wasted while idling in traffic
 - repairing leaking water pipes to reduce wastage and unnecessary water treatment processes.

Context – Global Economic Infrastructure Investment Needs Compared With Global Infrastructure Spending

Figure 1 provides estimates of the annual economic infrastructure investment (maintenance and new build) required to remain competitive. This range is from about 3% of GDP in developed economies to 9% or more of GDP in emerging economies. In some very low income countries it can be as much as 15% of GDP a year.

Appendix 2 provides further data and explains the rationale for global infrastructure requirements being about 4.5% of global GDP a year. In 2011 the IMF World Economic Outlook estimated global GDP to be US\$ 78.90 **trillion**⁷ making global infrastructure needs about US\$ 3.55 **trillion** a year.

Figure 1: Annual Infrastructure Investment and Maintenance Needs (% GDP)

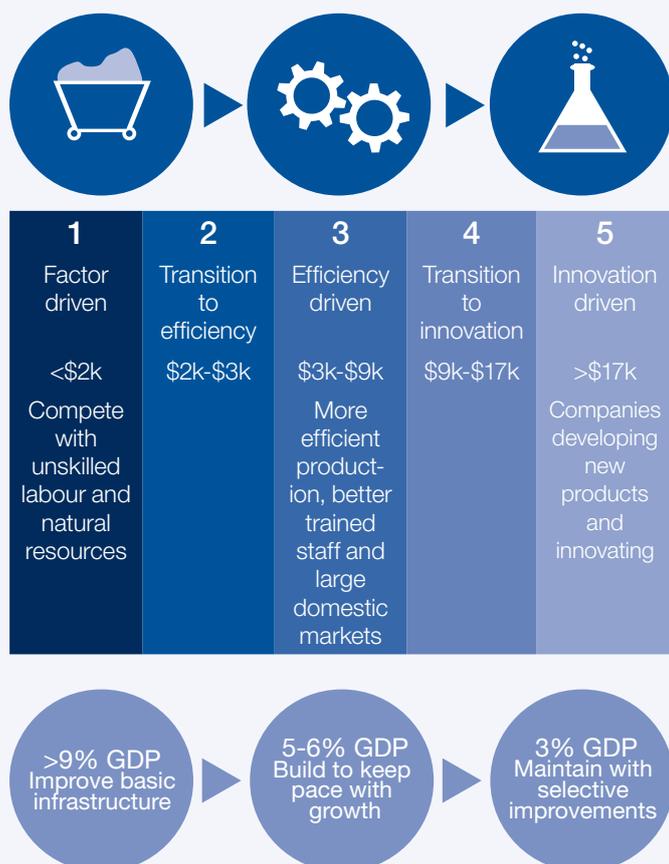


Sources: Global average based on the figure in Appendix 2 and the figures for the specific regions are based on African Development Bank, Asian Development Bank, et al. *Supporting Infrastructure Development in Low- Income Countries: Submission to the G20 by the MDB Working Group on Infrastructure. Interim Report. June 2011, p. 2.8*

Box 3: Infrastructure Priorities Reflect the Country's Stage of Economic Development

As identified by the World Economic Forum's *Global Competitiveness Report*⁹, countries at different stages of economic development have different needs, which also means different **economic infrastructure** priorities.

The figure below shows that a country's competitiveness improves as it transitions from a factor-driven economy to an innovation-driven economy. At each of the stages of economic growth implied by the country's GDP per capita (US\$ '000), indications are given of the amount (as a percentage of GDP a year) and the type of infrastructure investment required.



Factor-driven countries (Stage 1) and countries in transition from factor-driven to efficiency-driven (Stage 2) will typically have small **economic infrastructure** networks so their challenge is to build new capacity, broaden and widen coverage and improve the quality of **economic infrastructure**. At these early stages of development **economic infrastructure** investment is one of the main generators of competitiveness, and resultant economic growth.

As countries mature and have basic **functional infrastructure** assets, other factors become key drivers to competitiveness (possibly with the exception of telecommunications and Internet networks) as societies become more innovative. However, that does not mean **economic infrastructure** investment is not important. It is, and remains so. But the challenge is to maintain the extensive networks of roads, railways, energy grids and water pipes to acceptable standards and make strategic investments at key bottleneck points. For example, congestion in cities needs to be addressed.

The OECD's Infrastructure to 2030 report and the MDB report to the Cannes G20 High-Level Panel on Infrastructure¹⁰ highlights that most economies do not invest sufficiently in infrastructure. This means maintenance and replacement schedules are being missed and the quality of infrastructure is deteriorating. The difference between required and actual **economic infrastructure** investment is called the **infrastructure gap**. With the latest 2011 estimates of global infrastructure spending at about US\$ 2.6 **trillion**¹¹, this leaves a global **infrastructure gap** of about US\$ 1 **trillion**, or 1.25% of global GDP a year (see Appendix 2 for further details).

Report Objectives and Structure

The G20 Seoul, Korea (2010) declaration stated that "We will implement a range of structural reforms to boost and sustain global demand, foster job creation, contribute to global rebalancing, and increase our growth potential, and where needed undertake ... investment in infrastructure to address bottlenecks and enhance growth potential."¹²

After the Seoul meeting, participants at the 2011 World Economic Forum Annual Meeting in Davos-Klosters stated that in order to maximize the benefits from **economic infrastructure** it is essential that governments address two fundamental questions, namely:

- how should government prioritize which **economic infrastructure** projects create the greatest impact in terms of economic growth, social uplift and sustainability?
- once prioritized, what should government do to help ensure the projects are delivered effectively and efficiently?

The next section, the Background, gives the reasons why **strategic infrastructure** is required. Part A explains the benefits of preparing an **economic infrastructure** plan before providing an actionable framework to enable governments to formulate a prioritized plan. Part B then contains guidance on how to deliver taxpayer-funded infrastructure more efficiently and effectively. The Report expands on work already commissioned by the World Economic Forum, including *Paving the Way: Maximizing the Value of Private Finance in Infrastructure* (2010), *Revitalizing the Global Economy through Positive Infrastructure* (2010), *Scaling up Renewables: Developing Renewable Energy Capacity* (2011), *Benchmarking National Attractiveness for Private Investment in Latin American Infrastructure* (2007), and the annual World Economic Forum *Global Competitiveness Report*.

Background

Why is Strategic Economic Infrastructure Needed?

Key points

- In most countries resources are limited so infrastructure investments need to represent best value for money; investments need to be strategic
- This can mean focusing on maintenance and refurbishment at key bottlenecks

It is only by addressing the **infrastructure gap** that many of the economic, social and environmental benefits of **economic infrastructure** can be secured and countries steered back on to a course of sustainable economic growth. Therefore, more investment is needed from a combination of taxpayer and user-funded sources. Both have constraints:

- As illustrated in Appendix 2, with the exception of North Africa and the Middle East, governments are generally forecast to have annual budget deficits at least until 2016. Governments need to decide where to allocate their tax receipts, whether to education, healthcare, defence, social security or **economic infrastructure**. With hard decisions to make, they may see a reduction in maintenance schedules and investment in new **economic infrastructure** as tempting. While one or two years of **economic infrastructure** underinvestment causes few problems, the costs of future repairs mount if maintenance cycles fall into arrears for a number of years. The World Bank estimates that one dollar spent in road maintenance can save up to four dollars spent on road rehabilitation.¹³ Another World Bank study by Heggie and Vickers found that one dollar spent on road maintenance can save a further two or three dollars for motorists through lower fuel bills and lower vehicle maintenance costs.¹⁴ As a Ministry of Infrastructure, Ontario (Canada) report states, “*Estimates of the costs of deferred maintenance vary across types of asset, but many experts cite a ‘Rule of Five’ that says every dollar of maintenance put off now will cost five dollars later.*”¹⁵
- In many infrastructure sectors, charging users to access infrastructure is not common or is perceived to be politically difficult to introduce.

Recognizing that in the current economic climate some degree of **infrastructure gap** will remain, it is all the more important for governments to prioritize those **economic infrastructure** projects that are most strategic and generate the greatest impact in terms of economic growth, social uplift and sustainability.

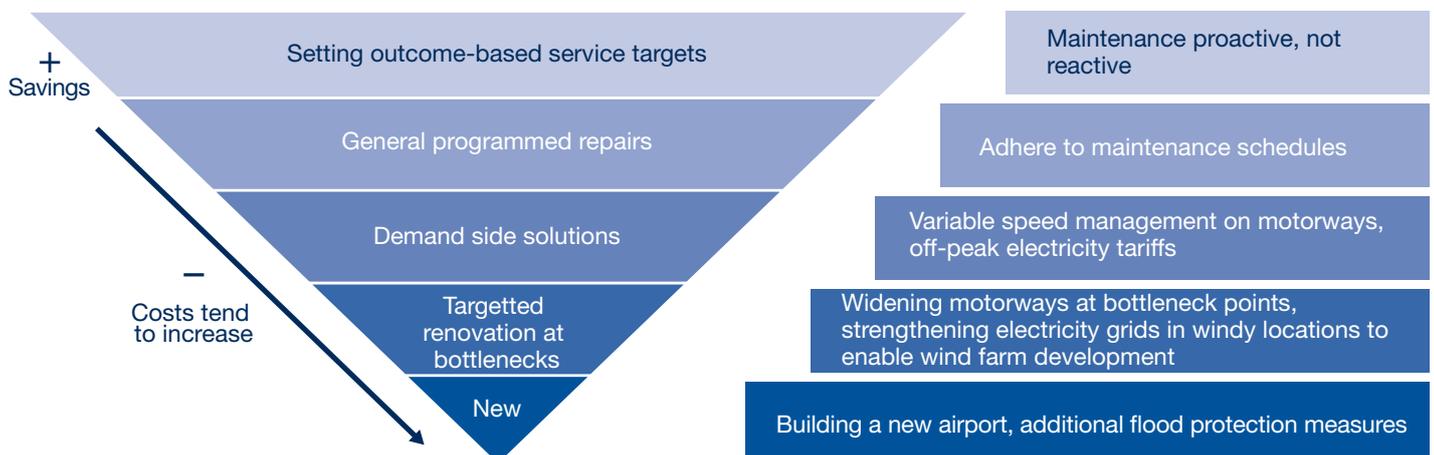
In addition to prioritizing the most strategic projects, governments should maximize their use of scarce funds by encouraging user-pay models where possible so they can use their monies for projects that are not commercial. For the non-commercial projects, governments should explore different ways of procuring infrastructure more cheaply or efficiently, as discussed in Part B of the report. Further, for taxpayer-funded and user-funded projects options governments must ensure that the enabling environment is conducive to investment.

Examples of Strategic Economic Infrastructure

Creating **strategic economic infrastructure** does not always mean building new illustrious projects. Rather the focus is on building or repairing infrastructure that maximizes economic, social and environmental benefits in a cost-effective way.

Significant savings can be achieved by requiring planners and designers to specify the outcomes required, rather than immediately proposing new projects. Often new building works are not needed – altering maintenance schedules would be sufficient. Changing the design and commissioning mindset of architects, engineers and government planners can take time, but doing so can result in totally different, more **strategic infrastructure** solutions.¹⁶ This is illustrated by the **Hierarchy of Quick Infrastructure Wins** in Figure 2.

Figure 2: Hierarchy of Quick Infrastructure Wins, with Examples



Outcome-based Service Targets

As stated, it is possible to save money simply by moving from task-based maintenance schedules to outcome-based service targets, as illustrated by the the following case study of introducing a performance-based maintenance contract for roads in Chad.

Case study: Performance-based Contracts to Improve Infrastructure Maintenance in Chad

Performance-based road contracts have proved successful in improving the quality of road maintenance in many countries. Chad suffered from poor maintenance of its road network because of inappropriately specified contracts. In 2001 the government of Chad awarded a performance-based contract to a subsidiary of a French construction services company for 441 kilometres of unpaved main roads (about 7% of the primary network) stretching across central Chad that were previously passable only in the dry season. The contract paid a monthly fee for each kilometre of road maintained to pre-defined standards for:

- passability - the road can be driven
- average speed attainable
- user comfort
- durability – an assessment of the long-term sustainability of the road.

If the company failed to comply with any of the service criteria, its monthly fee was reduced. If there were many failings the contract could be suspended.

The company had 22 months to achieve the pre-defined standards, and not only did it comply with these standards but in a number of instances exceeded the standards. A 2005 World Bank study reported that *“the roads are in excellent condition and the road users are highly satisfied. In fact, one criticism of the scheme is that the quality of the roads is ‘too high’..... Although no detailed assessment has yet been performed it is expected the contract will result in long-term capital cost savings.”*

Source: World Bank Group, *Output-Based Aid in Chad: Using Performance-Based Contracts to Improve Roads*. April 2005.

Demand-based Solutions

Different countries have different degrees of willingness to pay for **economic infrastructure** and services. However, in those societies where consumers are prepared to pay to access **economic infrastructure**, demand-based techniques can be adopted. These can be used to increase the overall utilization of infrastructure assets; rather than building new infrastructure, demand can be smoothed by reducing over-capacity during busy periods and increasing utilization at other times of the day. For example, many countries have domestic telephone plans for free evening and weekend calls that encourage households to make calls during those periods when telephone-line demand is reduced.

As another illustration, congestion charging is used to reduce rush-hour gridlocks. Although it costs some money to install congestion-charging systems, once installed the systems can generate revenues for the municipality. For example, it took about three years to repay the cost of installing the congestion charging scheme in London.¹⁷

Targeted Renovation at Bottlenecks

Sometimes simply upgrading a few key bottlenecks in the network can offer almost as many benefits as a total refurbishment of a network. For example, it maybe possible to reconfigure three or four traffic junctions or strengthen one or two electricity interconnectors to dramatically improve the efficiency and utilization of networks.

Case study: Choosing to Refurbish Existing Assets Rather Than Build New Ones: Mother Teresa Airport, Albania

The Mother Teresa Airport on the outskirts of Tirana is the only international airport in Albania. By 2001 its poor condition was negatively affecting growth prospects for the country. To address the problem, the Government of Albania considered various solutions, including building a new airport or refurbishing the existing one. It was decided that the best value for money option was to retain the existing airport, convert the old terminal into office space, build a new passenger and cargo terminal, and build a new approach road to reduce transit times to the city centre.

In 2004, a 20-year **public-private partnership (PPP) concession**¹⁸ for the development and operation of the airport was signed between the Government of Albania and a concessionaire, Tirana International Airport SHPK, a consortium led by a leading German construction services company. The construction cost was approximately US\$ 85 million; at least 2½ times less than the cost of building a new airport. The project was a success with a threefold increase in passenger traffic since 2004 and an airport that conforms to international aviation standards – proof that projects with the most impact are not necessarily new construction schemes, but those for which the solutions are more appropriate for the situation.

Source: European Bank for Reconstruction and Development

Even when new **economic infrastructure** is justified, planners should be open to various technical solutions and different spatial configurations. For example, if one route for electricity distribution cables causes significant planning problems, it may be possible to bury cables for short distances or use a less visually intrusive route.



Case Study: How Colombia Addresses 3 Projects with Economic, Social and Environmental Benefits.

Economic Benefits

“The 1,071-km road connects capital city Bogotá with Cali, Medellín, other major cities, and the Caribbean coast. Traversing the country’s mountainous terrain, it will reduce travel time by about four hours for trucks and three hours for cars. It will also increase road safety and cut transport costs. the project was divided into three concessions, facilitating financing and avoiding single-operator risk. It became Latin America’s single largest PPP road project, mobilizing US\$ 1.9 billion in private sector debt and equity alongside the US\$ 800 million in government funding and toll revenues that will be collected over a period of several years.”

International Finance Corporation. *Toll Roads: Concessioning the Ruta del Sol*. In International Finance Corporation Telling Our Story: Infrastructure - How the Private Sector Helps. 2012 Vol. 6/ Issue 1. p.32-33.

Social Benefits

The World Bank has made US\$ 350 million of loans available for:

- installing the infrastructure required to begin operating Bus Rapid Transit systems in large Colombian cities
- offering incentives for the creation of transport operating companies, integrated fare collection systems and centralized fleet control technologies in smaller cities.

“A transport system which is able to provide efficient, low-cost and safe mobility and accessibility for all inhabitants in the city is a powerful tool to promote growth, alleviate poverty and achieve social cohesion, while at the same time improving environmental conditions and prompting public space improvements.”

Source: World Bank Group. *World Bank Loan to Support the National Urban Transit Programme Project*. June 2011

Environmental Benefits

The Clinton Climate Initiative’s (CCI’s) Hybrid and Electric Bus Test Programme is helping to reduce CO₂ and pollution in Bogotá.

“This program tackles one of the most significant sources of carbon emissions in the region. By providing governments and companies with sound data and analysis, we support effective decision-making on critical investments in new transportation technologies.”

Source: CCI, C40 Cities: Climate Leadership Group – quote from Manuel Olivera, CCI’s City Director, Bogotá.¹⁹

Part A

How Should Governments Prioritize Which Economic Infrastructure Projects Create The Greatest Impact in Terms of Economic Growth, Social Uplift and Sustainability?

Key points

- It is recommended that governments prepare a national economic infrastructure plan to help them prioritize taxpayer-funded and user-funded infrastructure investments
- To provide a baseline it is important to understand the condition of infrastructure assets in a country
- Governments can use the framework of a long-term vision and medium-term outcome-based infrastructure goals to consider possible infrastructure investments over the next few years
- A methodology to optimize the choice of projects that address growth, social uplift and environmental concerns is explained

Infrastructure is rarely under the remit of one government department, with many government ministries or departments having their own **economic infrastructure** ambitions. A Ministry of Transport may want to build 500 kilometres of new railway lines and build a new airport, while a Ministry of Energy may want to strengthen the national grid and increase energy supply by 10%. A Ministry of Environmental Protection may wish to strengthen coastal flood protection, and a Ministry of Agriculture and Fisheries may hope to improve the reliability of irrigation networks in an area.

As explained in the Background, given the size of the **infrastructure gap** and the fiscal constraints in most economies it is unlikely that funds will be sufficient to deliver all the ministerial or departmental infrastructure plans. To help prioritize these infrastructure projects it is recommended that governments should develop a cross-sector **economic infrastructure** plan. Box 4 explains many of the benefits of preparing such a plan.

Outside centrally planned economies, the concept of preparing an **economic infrastructure** plan is still comparatively new. While many countries may have a 20-year vision for their economy, which may include some infrastructure aspirations, the rationale for specific infrastructure projects or evidence that these infrastructure projects are affordable and deliverable may be lacking.

As the concept is new, no accepted definition of what is the best practice for prioritizing infrastructure yet exists. As countries are of different sizes, at different stages of economic development and have different political priorities, the creation of a standard, one-size-fits-all best practice template is unlikely. Nevertheless, as an increasing number of countries publish infrastructure plans it is becoming clear that a number of steps are required. As highlighted in Figure 3, to provide context and overall direction it is recommended that planners start off with a long-term (circa 50-year) **infrastructure vision** and use this vision to define the **infrastructure goals** (or expected outcomes) required over the next 10 or so years, before defining particular prioritized projects for the next few years. Importantly, whatever plan is prepared also needs to be aligned with countries' economic and industrial plans and visions, if these plans exist.



Box 4: Benefits of Preparing an Economic Infrastructure Plan

There are four main benefits of preparing an **economic infrastructure** summarized in the pictorial below, notably:

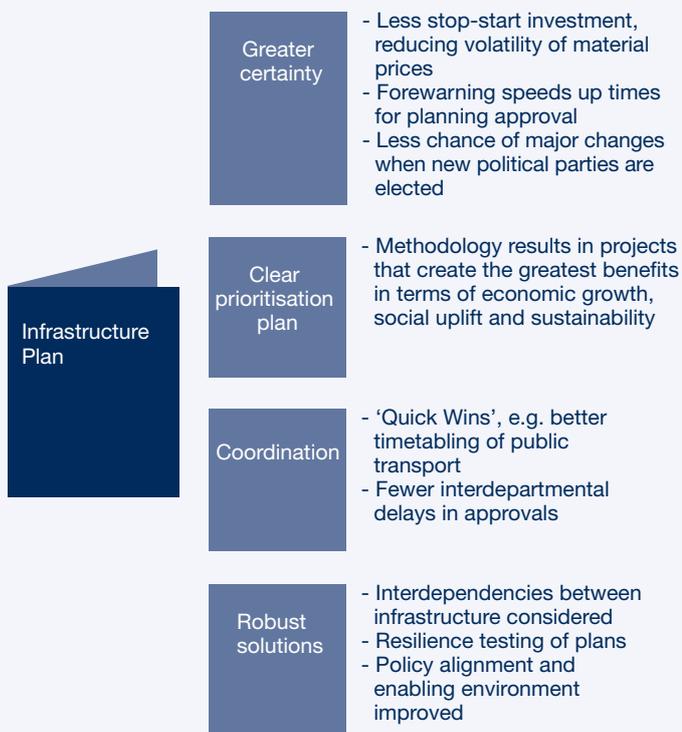
Benefits of Greater Certainty

A clear, well thought-out and deliverable plan with a clear pipeline of projects over the next few years:

- gives more confidence to construction companies, their supply chains and investors reducing instances of stop-start investment. This should decrease the cost of infrastructure and reduce some of the volatility in materials prices²⁰. For example, cement prices can rise considerably in periods of high construction demand. With greater certainty, construction and supply-chain companies should also be prepared to invest more in skills training which will improve employee retention rates and the productivity of workers
- gives civil society greater forewarning of investment plans, which should enable planning approvals and any necessary mitigation requirements to be secured sooner, reducing delays
- encourages a focus on the whole infrastructure sector and cooperation between governments and stakeholders
- reduces the chance of wholesale changes to plans when political administrations change, as the plan should provide a clear evidence-base for prioritized projects and a basis for cross-party buy in.

Clear Prioritization Methodologies

By introducing sensible and rigorous prioritization methodologies, civil servants will become accustomed to the new procedures. Even if political administrations change and some project priorities alter, it is very likely the new administration will retain the methodology and approach of selecting projects that have the greatest benefits in terms of economic growth, social uplift and sustainability.



Coordination Benefits

The very act of preparing a national **economic infrastructure** plan requires government departments to contact each other, which can produce "*quick wins*". For instance, discussions between authorities that grant planning permissions and a Department of Energy may result in quicker planning decisions on new applications to build wind turbines.

Case study: Quick Wins From Integrated Planning – Guangzhou's Sustainable Transport System

China's southern city of Guangzhou is leading the way in developing an integrated transport network that aims to reconcile rapid economic growth with the needs of ordinary people. In 2010, it opened the largest bus rapid transit system in Asia, which carries 800,000 people a day, links with the city's rail network and offers a series of bike-sharing stations along the route. The metro system already carries 4 million people a day and there are plans to almost treble the rail network by 2020.

The Institute for Transportation and Development Policy, a non-profit that works with cities to reduce greenhouse gases, awarded Guangzhou its Sustainable Transport Award in 2011. The institute said that the city's transport development make it a place that "*goes against the idea of a burgeoning Chinese metropolis that's only serving the economy.*" Easing transport congestion and reducing pollution in rapidly growing economies such as China will require the coordination of land-use planning, information technology, and mass-transit development, as well as cleaner vehicles. Guangzhou is making strides in all these directions.

Source: Siemens

Robust Solutions

Having an encompassing infrastructure plan enables **interdependencies** between different **economic infrastructure** assets to be considered. Whole plans can also be tested for resilience (for example against scenarios of a one-metre rise in sea levels or very cold winters). Additionally, having a consolidated plan will highlight the need for enabling legislation and policy changes to stimulate **economic infrastructure** investments.

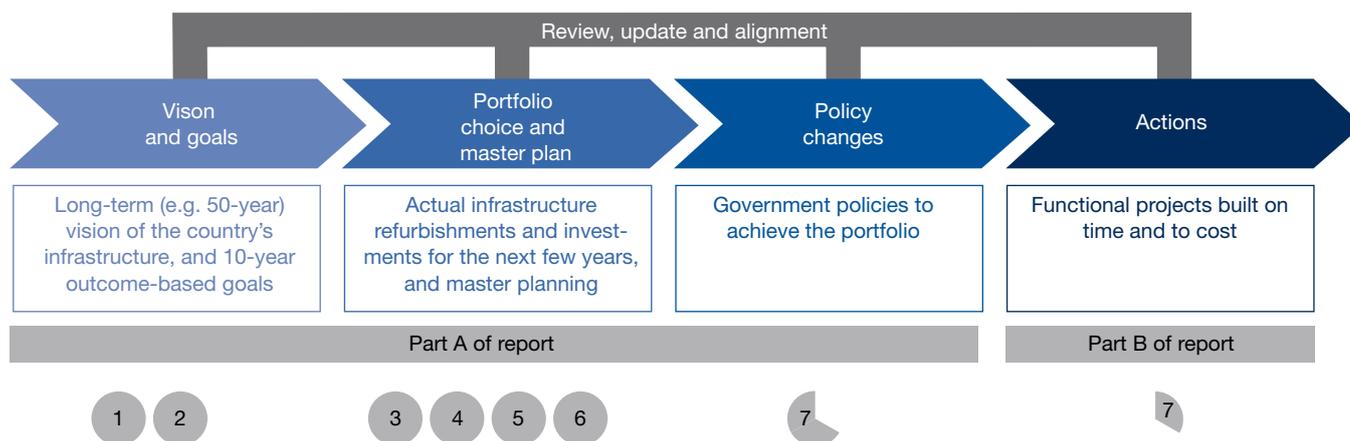


Those countries that have been most successful in attracting finance have established programmes of prioritised investment opportunities with a number of features, including clear political support, a proper legal and regulatory structure, a procurement framework that can be understood by both procurers and bidders, and a credible project timetable. These country programmes are more than just marketing – they eliminate key frictions, such as long project lead times and unclear political risk, which directly impact the viability of the business case...



World Economic Forum. *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. 2010. p.x

Figure 3: Suggested components of Economic Infrastructure Plans



Source: Partly based on HM Treasury. *Strategy for National Infrastructure*. March, 2010, p. 26

Creating a Cross-Sector Economic Infrastructure Plan

There are seven stages required to prepare a cross-sector economic infrastructure plan and Figure 3 shows where the seven stages lie on the planning continuum.

Section A.1 suggests that the first stage of preparing an infrastructure plan is to acquire an understanding of the country's current state of readiness for infrastructure investment. The World Economic Forum has introduced a new tool to help governments develop infrastructure plans – the **Strategic Infrastructure Planner Tool**.

Section A.2 explains how the **infrastructure vision** and **infrastructure goals** of the country can be prepared.

Section A.3 recommends that once governments have defined their visions and goals they should start formulating lists of possible projects that address some of the medium-term **infrastructure goals**.

Section A.4 provides more detail about how governments can decide which project/s best deliver/s the required infrastructure at a particular location.

As most governments have limited fiscal resources, Section A.5 suggests options to maximize the impact of their infrastructure investments by focusing on non-commercial infrastructure. Governments should then encourage private-sector provision of commercial projects if they meet their economic, environmental and social objectives.

Section A.6 proposes how, once governments have a ranked list of infrastructure projects and a greater understanding of which projects are commercial, they can prioritize and procure those infrastructure projects within their affordability envelope that have the greatest impact. Having an approved pipeline of prioritized projects then means governments can start addressing practical delivery questions. For example, **master plans** can be prepared as a way to visualize building programmes, and steps can be taken to start securing land-use planning approvals and acquire any necessary land parcels.

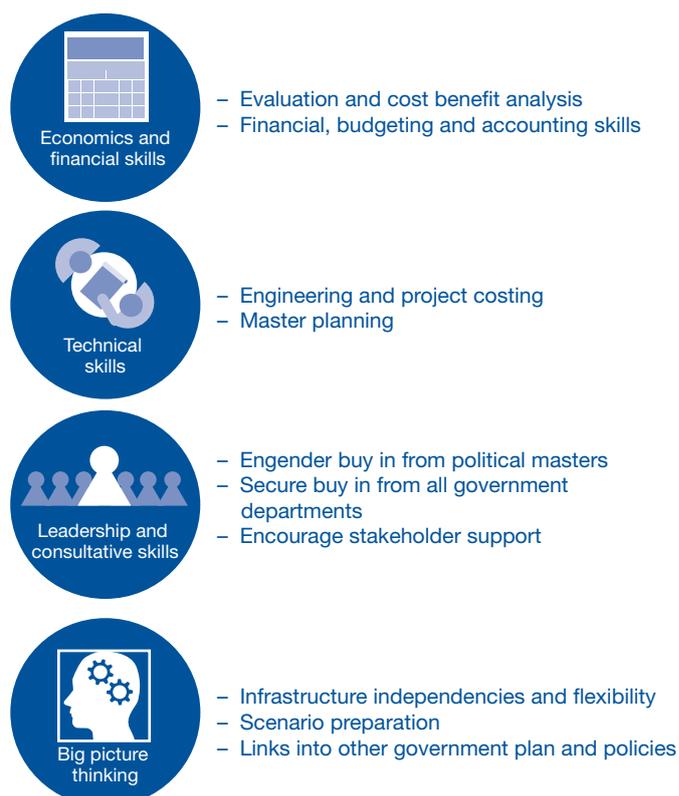
Section A.7 concludes with guidance about how to market the plan and ensure policy changes are made. It also briefly explains the steps required to move the approved projects onto the tendering stage (the **project preparation phase**), which is why part of the seventh circle in Figure 3 could be considered in Part B of the Report.

Resources to prepare a plan

Preparing an **economic infrastructure** plan for a country can be challenging as assets last for very long periods and decisions made today will affect localities for decades to come. Further, infrastructure assets typically create visual intrusions that can generate disquiet, whether it is a new pipeline crossing the countryside, a road, a power station or a mobile phone transmitter mast. Pollution can also arise. So strong **NIMBY** ("Not In My Back Yard") emotions are possible. For instance, most people support the concept of renewable power, but local reticence occurs when a windfarm developer proposes turbines in the vicinity of their dwellings.

Therefore, the skills required to both plan and prioritize infrastructure should not be underestimated. The government's team will need staff with different expertise, including economic, engineering and leadership and consultative skills. Figure 4 provides further details.

Figure 4: Skills Required to Plan and Prioritize



A.1. Stage 1 – Understanding the Current Situation

Key points

- Before spending large amounts of money on infrastructure it is very important to understand the current condition of assets
- A perceptual Strategic Infrastructure Planner Tool is presented to augment any qualitative evidence-based data the government may have

Before the government can start defining the long-term **infrastructure vision** and the medium-term infrastructure goals, an analysis of the current **economic infrastructure** assets and the state of the country's infrastructure readiness is needed. This baseline information can be used to determine what the requirements are going forward

Infrastructure Investment Readiness

As identified at the 2011 G20 meeting in Cannes, the use of an agreed multidimensional measurement methodology should be encouraged to enable governments and stakeholders to reliably assess the infrastructure investment readiness of their countries.²¹

Building on the methodologies developed in the World Economic Forum's report, *Benchmarking National Attractiveness for Private Investment in Latin American Infrastructure*, the World Economic Forum has formulated a framework to help governments analyse the current infrastructure investment readiness of a country, and also help to provide a longer-term vision.²² The World Economic Forum's Strategic Infrastructure Planner Framework evaluates a countries' infrastructure readiness against 14 parameters, as illustrated in Figure 5. Both publically owned and privately owned infrastructure should be considered.

Figure 5: Strategic Infrastructure Planner Framework – 14-pronged Economic Infrastructure Readiness Parameters



The 14 parameters are split into four main groupings: the infrastructure quality metrics; the government readiness metrics; the societal readiness metrics; and the market readiness metrics. By evaluating a countries' infrastructure readiness against these metrics, governments will obtain a comprehensive overview of the current state of infrastructure readiness in the country, which can then be used to assess future requirements (Section A.2).

To understand the current state of a country's infrastructure readiness against the 14 parameters, governments can use two approaches:

- **Evidence-based:** this detailed approach involves civil servants gathering information from existing sources and commissioning evidence-based surveys to address any information deficiencies to obtain a detailed oversight of the country's performance against each of the 14 metrics (e.g. collating information on the down-time of power grids to measure the availability and reliability of energy supplies). Such information should also include details about the threshold/capacity levels for infrastructure to be functional
- **Perceptual:** if evidence-based data does not exist or is difficult to obtain, a simpler approach is gathering information by asking stakeholders their views – in essence, creating a snapshot of the situation by amassing opinions from different stakeholders. These stakeholders can include their civil servants, academic and other infrastructure experts, the private sector and financiers and their constituents.

Many governments use a combination of both approaches, obtaining evidence-based information where it is already accessible or can be easily collected, and the perceptual method where data is lacking. Further information is provided below.

Evidence-based Analysis

The following section summarizes the type of evidence-based information countries need to collect to address each of the 14 parameters listed in Figure 5.

Infrastructure Quality

Many countries already collate high-level quantitative information. For example, the World Bank collects standardized metrics for many countries such as the length of roads and railways in a nation or the percentage of the population with access to potable water.²³

However, few countries have comprehensive infrastructure asset registers that list all the infrastructure assets in a country and the condition of each asset. If there is little information available, surveying the condition of assets can be a major venture. In addition to the resources required, an added challenge is that governments may be reluctant to commission the survey work in a difficult financial climate because it may, for instance, highlight wide geographical disparity in the quality of **economic infrastructure** or reveal significant underinvestment in the country and discourage investors. Nevertheless, avoiding the issue will only create further problems, while if issues are understood steps can be taken to address them before repair costs escalate rapidly.

When preparing an infrastructure asset register, it is often easier to start collecting information for smaller areas. It may be less burdensome, for example, to gather information for a region rather than for the whole country. The case study for the Province of Ontario in Appendix 3 shows what can be achieved. The United Kingdom has started to publish data on the condition of infrastructure assets, as well as service quality measures, reliability figures and capacity utilization percentages over time. The second case study in Appendix 3 illustrates a simplified evidence-based snapshot of the situation in the United Kingdom that amalgamates more than 100 data sources.

Broader studies are also being undertaken. The World Bank, for example, is supporting the Africa Infrastructure Country Diagnostic (**AICD**) as shown in the Case Study.

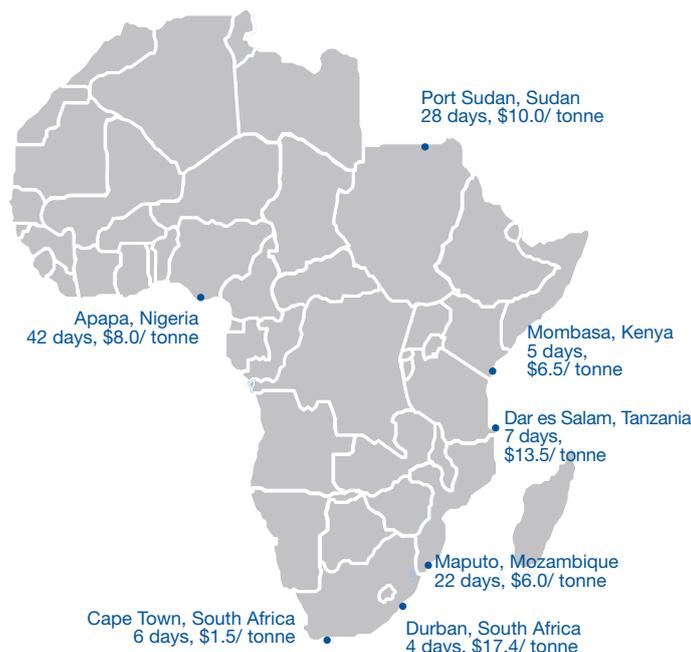
Case Study: Africa Infrastructure Country Diagnostic

The AICD grew out of a pledge at the 2005 G8 summit to substantially increase overseas development assistance to Africa, particularly to the infrastructure sector. To date 19 in-depth country assessments have been undertaken and analysis conducted in four African regions (the East African Community (EAC), the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West Africa States (ECOWAS) and the South African Development Community (SADC).

The studies collate detailed economic and technical data on the performance of infrastructure in different countries, for example benchmarking the efficiencies of major ports in Africa as follows:

African Ports

Average container dwell time in terminal (days)
Average general cargo handling charge ship to gate (US\$/ tonne)



Source: World Bank Group. *Africa Infrastructure Country Diagnostic*, 2012²⁴

Government Readiness

Governments can undertake extensive surveys of their ability to encourage infrastructure investment. For example, to assess the “*rule of law and effectiveness of law-making bodies*” parameter detailed annual statistics can be assembled for the number of legal judgements that are not enforced. For the “*government’s track record of infrastructure projects*” parameter, the number of government tenders that are delayed or altered, or the number of tenders where there are scope changes once the procurement starts, can be recorded.

Such data collection should be encouraged. It may also mean benchmarking data against information collected in neighbouring countries. While there is much information already available, for example the World Economic Forum’s *Global Competitiveness Report*, often the data on government performance is perceptual rather than evidence-based.

Although not as difficult as assembling information about infrastructure quality, gathering information about government readiness still necessitates effort and requires governments to self-review their own effectiveness, which can occasion problems in itself.

Societal Readiness

The first societal readiness parameter, the “*maturity of civil society*”, is an attempt to understand the level of engagement civil society and NGOs have with the government. Questions include whether civil society can make its views known to government and lobby for certain improvements, and whether newspapers have the freedom to report issues within the country. Some organizations gather information on press independence, such as the Reporters without Borders Press Freedom Index.²⁵

The “*government or public willingness to pay*” parameter is an attempt to understand the degree of societal pressure to improve and develop infrastructure. In an emerging economy questions would include whether there is real social desire for everyone in the country to have access to potable water, and, if so, are taxpayers and/or local communities prepared to build the networks. If government funding is not available, just achieving an acknowledgement from grassroots communities that they need to pay means they can start developing their own low-cost water networks; for example, forming cooperatives where the members can build and maintain the networks themselves.

Market Readiness

A good deal of accessible information on the availability, or lack of availability, of finance can be collated to address the parameter “*availability of finance*”. For example, the World Bank has its Private Participation in Infrastructure (PPI) Project Database²⁶, the MDBs collate information and the firm Preqin prepares an annual review of infrastructure finance, as do other commercial entities.

Gathering data to answer the “*access to labour and materials*” and “*competitiveness of the construction industry and supply chain*” questions can be more difficult unless certain trade bodies or associations have already collected the information and are prepared to disseminate it.

The Perceptual Approach

A more immediate solution, although one not backed by hard metrics and thresholds, is to undertake a perceptual analysis of the current state of **economic infrastructure** assets. The government can ask their experts for their views or they can open up the conversation much more widely.

Opening up the discussion to a wider group of stakeholders can add two or three months to planning timelines, but this is much less than the time required to collect robust evidence-based data. The evidence-based approach is also limited in that it only helps to understand the current state of a country’s infrastructure readiness; for any future assessment and projections have to be perceptual.

Therefore, governments should engage with stakeholders as soon as possible and will learn a great deal about what their constituents want. Key stakeholders the government can solicit include representatives from certain government ministries/departments, the private sector, NGOs and civil society, as well as academics and experts. In addition, given the importance of international trade and investment, governments should speak to international private investors, MDBs and government representatives from neighbouring countries to get more context into the key issues.

Governments are often loath to engage stakeholders early in their prioritization process for fear that resultant plans will be jeopardized by particular interest groups. However, such reluctance can prove shortsighted as disquiet will remain if issues are left unaddressed.

In particular, debate around the most contentious issues will help not only to understand the perspectives of different parties but also to:

- highlight contentious issues early. This means that during future meetings, or when actual project specific plans start being formalized, stakeholder engagement should be more productive as parties will be able to focus on the contentious points without getting drawn into discussing extraneous issues
- get stakeholders to listen and attempt to mediate disagreements in a non-confrontational setting. For instance, it may be possible to resolve some differences amicably by compensating the aggrieved party. As illustrations, new nature reserves can be formed to mitigate damage caused by new roads, or displaced populations can be moved to housing of higher standards.

Disagreements will inevitably remain, but at least stakeholders will have a greater understanding of the reasons behind certain decisions which often allows projects to be delivered more quickly and cheaply once “*in principle*” government approval is given.

To undertake a perceptual analysis, the government could begin by convening a half- or full-day meeting in which government officials, experts and key stakeholders offer their own views and thoughts on the quality of the country’s **economic infrastructure** using the 14 parameters of the **Strategic Infrastructure Planner Framework**.

A facilitator should be employed to moderate the meeting, using a communication and strategy planning methodology akin to the Decision Dialogue Process.²⁷

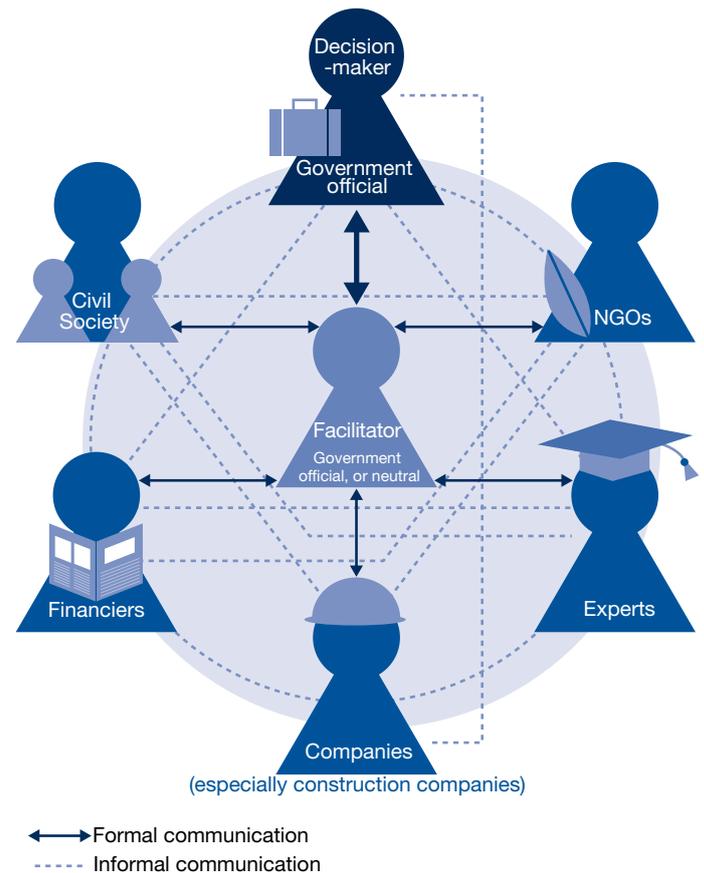
Case Study: Stakeholder engagement in Australia and the United States

“In 2006 and 2007, the Australian provinces of Victoria and New South Wales, the city of New York and the state of Washington launched processes to engage constituents in defining a baseline for service provision upon which a comprehensive infrastructure plan can be developed. These processes have delivered significant benefits, including defined goals for service delivery; ensuring consumer-based service delivery by engaging a diverse range of constituents; creating the basis for setting investment priorities and balancing competing needs across sectors; providing a natural framework for measuring performance and accountability; and earning broad-based public support and responding to public concerns early on.”

Source: Dowall, D.E and R. Ried. 2008. A Strategy for Infrastructure: *The California Infrastructure Initiative*. In Access, University of California Transportation Centre, Spring 2008, 32:18-25.

Figure 6 provides an example of a process similar to the Decision Dialogue Process, with a facilitator (who could be a government employee/official or a neutral individual) acting as chair, collating views and tightly managing the debate, while also letting everyone have a chance to make relevant points. Central government (as the ultimate decision-maker) will then contribute its views and ideas to the meeting as a participant, listening to what is said and responding openly to questions asked.

Figure 6: Vision Preparation Phase Options With Government Involved in the Project Team



During the meeting time needs to be set aside for stakeholders to discuss issues directly with each other, allowing new bonds and networks to be generated.

In the case illustrated with a neutral facilitator, the government official (as the decision-maker) contributes to the meeting as a participant.

Box 5 outlines the steps needed to perform this perceptual analysis, using the **Strategic Infrastructure Planner Framework** and asking individuals to rate each parameter on a scale of 0-10 (or 0% to 100%) to generate **Strategic Infrastructure Planner Tool** results. Box 5 also includes a hypothetical example of the results that could arise from a discussion between a group of government officials and a group of representatives from civil society.

The resulting **Strategic Infrastructure Planner Tool** does not attempt to consider the importance of one parameter over another, nor create an overall single index number, because whatever weighting was decided would be open to critique, especially if the same weights were prescribed for use in every country. For example, a weight of 10% for the “*quality of land transport (road and rail)*”, 5% for the “*quality of ports and air transport*” and 6% for the “*availability and reliability of telecommunications networks*” may be appropriate for a country with a high population density, such as Singapore, but inappropriate for a sparsely populated country such as Mongolia.

At the end of the meeting, the government official, the ultimate decision-maker, will have gained a greater understanding of the differing views. The government will then be in a position to start formulating potential solutions and thinking about long-term infrastructure requirements, discussed in the Section A.2.

Appendix 4 explains the Decision Dialogue Process in more detail, suggests options for configuring meetings and highlights the vital importance of correctly marketing and engaging with stakeholders in an open and consistent way.

Box 5: Strategic Infrastructure Planner Tool: Stages

Stage 1: A meeting of representative stakeholders should be convened, splitting the participants into three or four groups based on their professions or interests (with, for example, one group of government officials and another of private-sector employees).

Stage 2: Stakeholders should be asked to individually evaluate each of the 14 parameters of the **Strategic Infrastructure Planner Framework** on a scale of 0 to 10 (or 0% to 100%), using the table below as guidance. Zero (0) is deemed to be wholly unacceptable and 10 is the perceived optimum (not maximum) for the country at its current stage of development. To frame the issue, stakeholders can be asked to compare their country to a neighbouring country at a similar stage of economic development seen as having appropriate/optimal infrastructure. Conceptually, this is easier than asking participants in an emerging economy to rate their country against an advanced economy which will be at a totally different stage of economic development or with which they are unfamiliar.

Infrastructure Readiness

Quality of land transport (road and rail)	<ul style="list-style-type: none"> – Condition of roads/railways throughout the country – Congestion levels – Interconnectivity of public transport – Pricing of road and rail transport
Quality of ports and air transport	<ul style="list-style-type: none"> – Ease of transporting goods – Safety, passenger processing times and delays – Pricing
Availability and reliability of energy grids and power supplies	<ul style="list-style-type: none"> – Number of power outages, requiring expensive back-up generators – Access to power across the country – Pricing of power
Availability and reliability of telecom networks	<ul style="list-style-type: none"> – Availability of landlines, mobile and high-speed broadband facilities – Pricing of telecommunications
Quality of waste and water infrastructure	<ul style="list-style-type: none"> – Percent of population with access to potable water – Quality of waste disposal services – Pricing of waste and water services

Market Readiness

Competitiveness of the construction industry and the supply chain	<ul style="list-style-type: none"> – Competitiveness of the construction industry measured by number/concentration of large construction companies and extent of competition in pricing of tenders – Competitiveness of the supply chain providing specialized skills, e.g. engineers and haulage companies
Access to labour and materials	<ul style="list-style-type: none"> – Availability of labour with the requisite skills – Quality and availability of educational training in engineering and construction skills – Access to construction materials in the country, and price volatility
Access to finance	<ul style="list-style-type: none"> – Strength of local banks – Ease for foreign banks to enter the market and engage in foreign exchange transactions – Willingness of banks to lend to construction and supply chain companies as well as for infrastructure projects

Government Readiness

Rule of law and effectiveness of law-making bodies	<ul style="list-style-type: none"> – Clarity and consistency of legislation – Effectiveness and impartiality of the judiciary – Extent judicial pronouncements are enforced
Government's openness and impartiality	<ul style="list-style-type: none"> – Transparency of awarding contracts²⁸ – Frequency of government decisions being changed, or lack of advance notice of project pipelines
Government's track record of infrastructure projects²⁹	<ul style="list-style-type: none"> – Evidence of clear prioritization of projects – Number of projects that overrun in terms of cost or time – Number of changes of scope during the procurement/commissioning phases
Government's willingness to engage with the private sector	<ul style="list-style-type: none"> – Extent the government engages with the private sector – Openness of the government to foreign companies

Societal Readiness

Maturity of civil society	<ul style="list-style-type: none"> – Ability of civil society to effectively lobby government and engage in constructive debate – Representativeness of NGOs to civil society's views – Literacy rates, quality of journalism and degree of press freedom
Government or public willingness to pay	<ul style="list-style-type: none"> – Perceived importance of infrastructure in a country – Political acceptability for users to pay for infrastructure – Willingness for government to subsidize less advantaged members of society

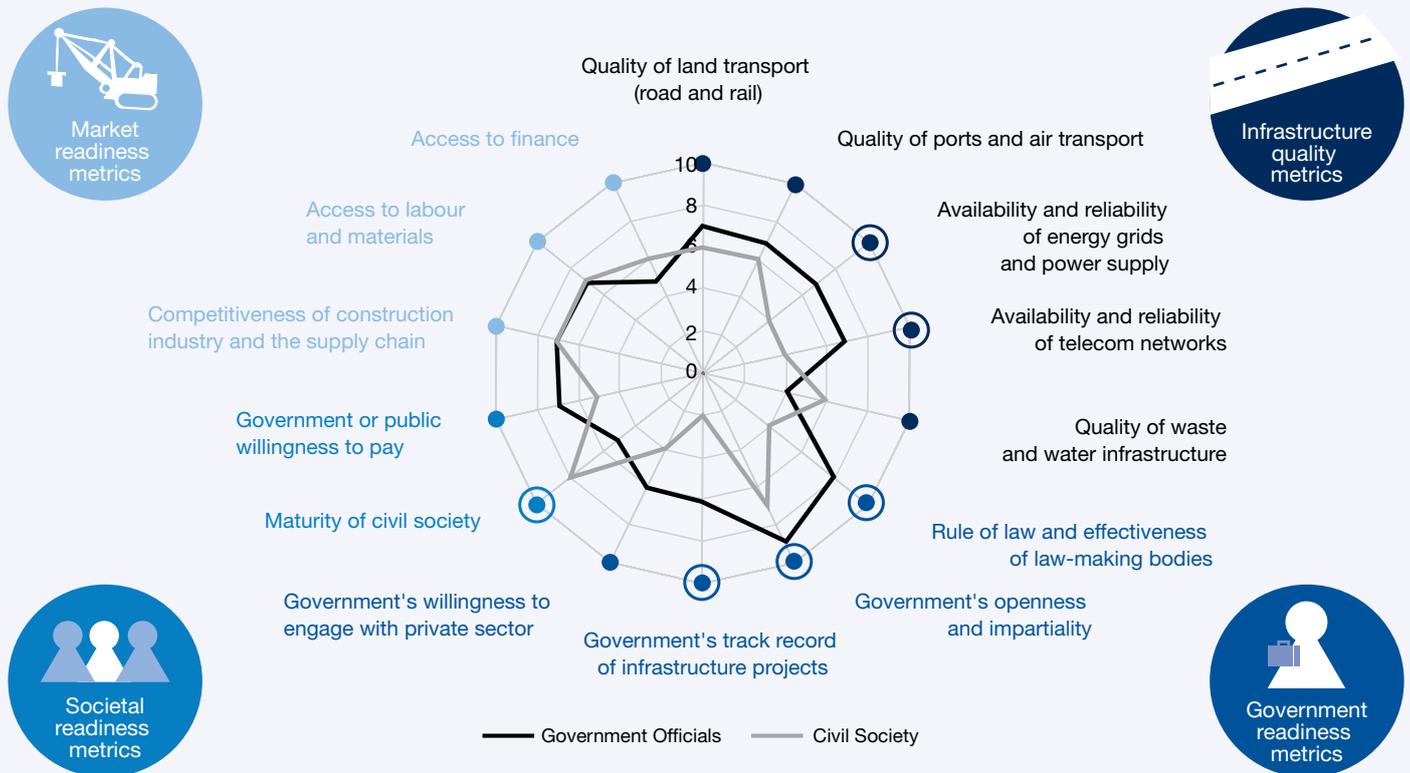
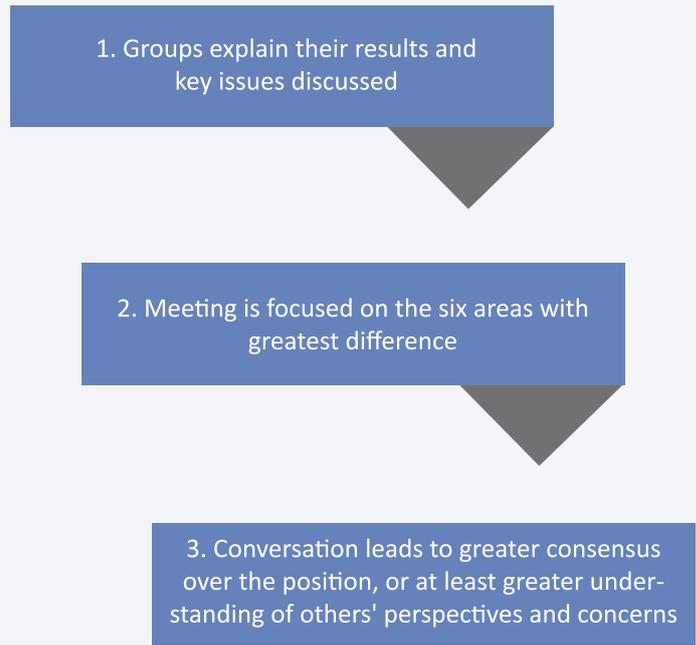
Stage 3: Once individuals have prepared their own scores they should be invited to discuss them within their group. Each group should try to reach consensus on the score for each parameter. Doing this in a group of committed people can help resolve issues, disagreements and extreme positions.

Stage 4: Using the principles akin to the Decision Dialogue Process, the facilitator encourages a spokesperson from each group to explain why their group allocated the scores they did (Step 1 in the diagram). After hearing the three or four presentations, the facilitator asks the groups to focus on those parameters with the greatest differences (Step 2 in the diagram). The radial diagram below shows possible results from such an exercise, where six parameters have been highlighted where stakeholders' perceptions differ by three or more points (shown with larger circles). The ensuing conversation may well result in stakeholders then changing their scores after realizing that the different groups are actually making the same point, but just basing their scores on different assumptions.

Stage 5: Hopefully by the end of the meeting there is convergence of perceptions and beliefs over the parameters (Step 3 in the diagram). Where disagreement over some of the parameters still exists, the parties should have gained a greater understanding of each others' viewpoints.

Stage 6: The results and insights gained can then be used by the stakeholders and government to consider what the infrastructure priorities and vision should look like in the longer term (see Section A.2).

Steps of Decision Dialogue Process



A.2. Stage 2 – Creating a Vision and Goals for the Future

Key points

- Because infrastructure assets last many decades decisions today affect future generations
- A long-term vision will help the formulation of outcome-based medium-term goals
- The Strategic Infrastructure Planner Tool is advocated to help prepare the vision and goals

With an understanding of the current quality of **economic infrastructure** assets and the current degree of **economic infrastructure** readiness, governments can consider what the **economic infrastructure** priorities should be over the long term (approximately 50 years), linking them into their long-term economic, industrial, environmental and social visions for the country, if such documents exist. Whereas analysis of the current situation can be supported by evidence-based condition surveys, any future looking analysis, by definition, has to rely on the government's and/or interested stakeholders' perceptions.

To provide further context, governments may want to prepare three or four “*realistic*” scenarios about where the economy may be in the future. These scenarios may consider different macroeconomic forecasts (e.g. economic growth, inflationary expectations and commodity price considerations), demographic projections, geopolitical changes, the impact of climate change and resource scarcity, and regional developments.

With this additional information it is recommended that the government continue its engagement with the stakeholders by convening a second, forward-looking stakeholder meeting to consider the country's future infrastructure. Alternatively, the two stakeholder meetings could be combined into one. main advantage of asking stakeholders to consider **economic infrastructure** in 50 years' time is that reflecting very far into the future makes them think:

- of future generations or the world when they are much older; this helps to soften political ideologies
- nationally rather than on challenges in the locality in which they live.

Asking participants to think 50 years into the future could be viewed as a difficult exercise. However, if asked to do so in the early 1960's, results would likely show that many projections would have proved remarkably accurate. For example, many people would have foreseen the growth of suburbs and urbanization, a dramatic increase in travel and a rise in electricity and power demand. Surprisingly, no infrastructure change has been revolutionary. This being the case, it may be that projections for infrastructure over the next 50 years prove reasonable.

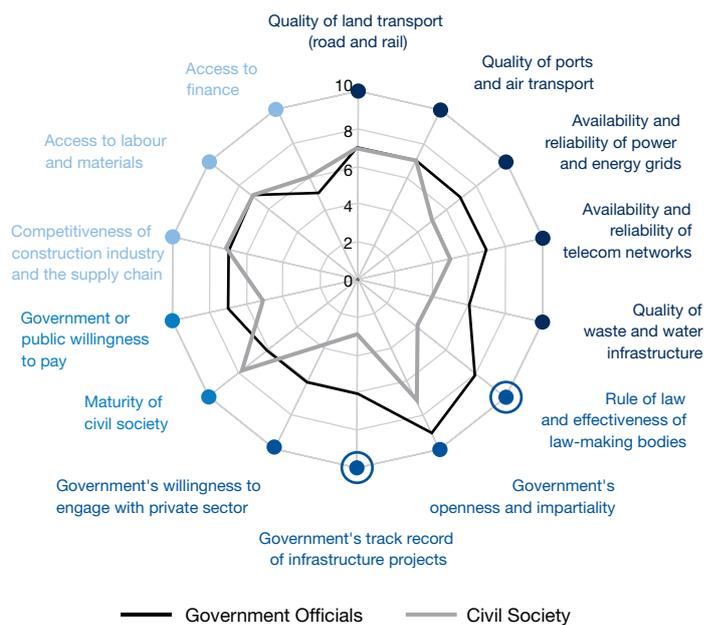
By already having debated different perceptions about the current state of **economic infrastructure**, it should be possible to keep the stakeholder conversation about future **economic infrastructure** requirements more focused and grounded.

Using the **Strategic Infrastructure Planner Tool** stakeholders should be asked: “*For each of the 14 parameters, what should the scores in 50 years' time be?*” When scoring the infrastructure quality metrics parameters, participants should also be asked to phrase their responses not only as a score but also in terms of desired outcomes (e.g. 20% shorter journey times, or the elimination of electricity blackouts), giving planners more opportunity to suggest innovative responses that solve the problem such as demand management techniques, improvements at key bottlenecks or “*leading edge*” design solutions.

Participants should be pragmatic in how they score each parameter, and should not score everything 10/10 (or at 100%). Rather, by considering scenarios, they should again be asked to compare their country against a neighbouring country that may be at a similar stage of economic development. For example, having the best airports may not be regarded as essential, while achieving energy security may be the most important issue. Alternatively, if rapid population growth is expected, improving road and rail capacity may be vital, as may improving the track record of government's success in procuring new projects.

The outcome of all these discussions should be a second forward-looking **Strategic Infrastructure Planner Tool** radial chart. A hypothetical example is shown in Figure 7.

Figure 7: Perceptual Scores of the Strategic Infrastructure Planner Tool Priorities in 50 Years' Time



As can be seen by comparing the illustrative results in Box 5 to Figure 7, there are fewer instances where the government's and civil societies' scores differ by three points or more, and as a generalization most scores have improved.

With some degree of consensus over many points, the government can then direct its attention to those areas where divergence remains. For if society in general has issues, politicians need to take heed, especially when elections loom. In the end, politicians will ultimately want to make the plan acceptable to the majority of the population, and even if there are difficult messages, if the plan is backed up by robust evidence it is also more likely to gain wider political consensus.

The World Economic Forum tested the **Strategic Infrastructure Planner Tool** in a workshop in Bogotá, Colombia in November 2011. Given the circumstances the future-looking approach and evaluation was slightly different, but still adopted the **Strategic Infrastructure Planner Tool** approach. The following case study summarizes the results, with detailed results in Appendix 5.



Case Study: Applying the Strategic Infrastructure Planner Tool in Colombia

On 28 November 2011, the Colombian Ministry of Trade, Industry and Tourism and Proexport Colombia hosted the World Economic Forum Competitiveness Workshop on Colombia in Bogotá. The meeting provided an opportunity to test and validate the tool and methodology, ending in participants stating they learned from the dialogue.

As Colombia already has an infrastructure plan for 2012-2021, rather than analyse future requirements in 50 years' time, participants were asked to evaluate where Colombia is currently and where it will be on each parameter by 2021 if the government's infrastructure plan is fully implemented.

Participants expressed concern that the government's 2021 plan does not have the correct balance of projects and there are insufficient interlinkages between proposed projects. This insight provides an opportunity for the government to reflect on its priorities.

The Finalized Infrastructure Vision

Collating all the feedback from stakeholders about the current state of **economic infrastructure** and ideas about **economic infrastructure** priorities over the next 50 years will give the government (as decision-maker) a greater understanding of the views of its constituents and others.

Along with its own research and findings and the research it has commissioned, it is then government's responsibility to finalize its **infrastructure vision**. The vision statement should be outcome-based, rather than specifying particular projects. An example of the **infrastructure vision** for Australia is provided below and an example of the infrastructure vision for the United Kingdom is in Appendix 8.

Case Study: Economic Infrastructure Vision for Australia

“Infrastructure Australia has identified themes that steer a course for solutions to meet the gaps, deficiencies and bottlenecks in our nation's infrastructure. These themes are:

- *A national broadband network: developing a more extensive, globally competitive broadband system*
- *Creation of a true national energy market: more extensive national energy grids to enable greater flexibility and competition in the nation's electricity and gas systems, while creating opportunities for the development of renewable energy sources*
- *Competitive international gateways: developing more effective ports and associated land transport systems to more efficiently cope with imports and exports*
- *A national rail freight network: development of our rail networks so that more freight can be moved by rail*
- *Adaptable and secure water supplies: more adaptable and resilient water systems to cope with climate change*
- *Transforming our cities: increasing public transport capacity in our cities and making better use of existing transport infrastructure*
- *Providing essential indigenous services: improved services for indigenous communities.”*

Source: Australian Government, Infrastructure Australia. *A Report to the Council of Australian Governments*. December, 2008, p. 7

If not already done, the vision should be stress tested against the three or four scenarios the government prepared when briefing stakeholders. Economic infrastructure plans and policies of neighbouring countries should also be reviewed and the proposals should be independently evaluated to see if they are realistic.

Using the Infrastructure Vision to Prepare Infrastructure Goals

As shown in Figure 3, once the government has defined its broad **infrastructure vision** it must attempt to decide what needs to be done over the medium-term that will go some way towards realizing the long-term **infrastructure vision**. **Infrastructure goals** for the next 10 years or so should be formulated. As with the vision, the goals should be outcome-based, balancing the economic, environmental and social objectives identified in the infrastructure vision.

A.3. Stage 3 – Using the Infrastructure Goals to Identify Possible Projects

Key points

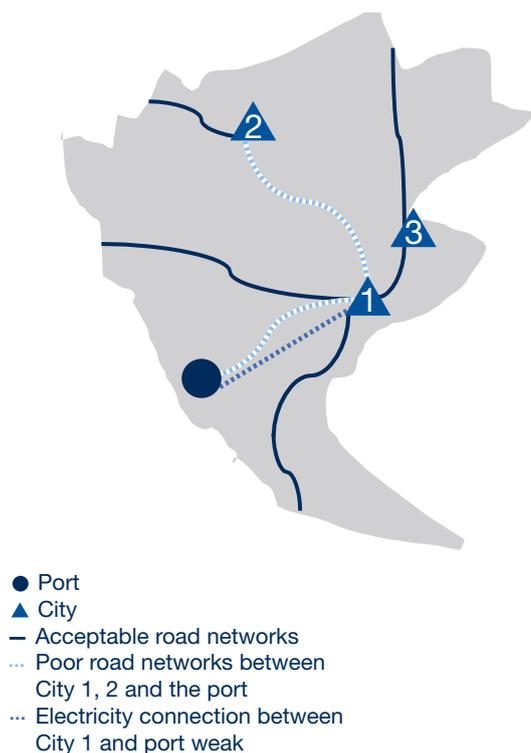
- For each of the infrastructure goals consider the implications of doing nothing or just following planned maintenance cycles
- Decide where the main deficiencies are and for these deficiencies consider a wide variety of possible solutions to help meet some of the goals over the next few years

For each **economic infrastructure** sector identified (e.g. transport, water, gas, electricity, waste and telecommunications), different options to achieve the medium-term **infrastructure goals** must be considered. This may appear to be a daunting task for a large country, but much can be gathered from the evidence-based or perceptual baselining of the current infrastructure assets (Section A.1) and the forward-looking analysis (Section A.2). Five main steps are recommended:

- **Step 1: Consider the implication of doing nothing or doing the minimum.** In each infrastructure sector, an analysis of the **do-nothing** or **do-minimum** approach is needed to understand what would happen to infrastructure services if no further actions were undertaken, or simply if existing maintenance schedules were followed. These **reference cases** provide a baseline against which to compare different project ideas and different technical solutions. In addition to the perceptual views gathered from stakeholders when they analysed where the focus of infrastructure investment should be in the future, this baselining will usually identify the areas and sectors of the country's infrastructure that require improvements.

Figure 8 provides a hypothetical example of an analysis that has identified three particular deficiencies if the **do-nothing/do-minimum** approach is adopted. The road between the port and City 1 will be sub-standard, as will the road between City 1 and City 2, and there will be frequent power outages between the port and City 1.

Figure 8: Map Highlighting Infrastructure Deficiencies in a Hypothetical Country



As well as identifying the relevant deficiencies, for each of the deficiencies an attempt should be made to evaluate all the costs and benefits of the **do-nothing** or **do-minimum** option using the methodology in Section A.4. Having a costed **reference case** enables different solutions to be properly contrasted as the aim of project evaluation is to compare the net benefits of a project solution over the **reference case** and the net costs of a project over the **reference case**.

- Step 2: Decide on which deficiencies to focus on over the next few years. If it is not immediately clear where the main focus areas should be, a wider range of deficiencies should be considered and the decision on which deficiencies to focus on first will then come out of the prioritization process explained in Sections A.4, A.5 and A.6.
- Step 3: Consider a range of solutions to address the deficiencies for each problem area. As mentioned in the Background, planners should always include the simpler, smaller-scale solutions as options, and utilize the **Hierarchy of Quick Infrastructure Wins** methodology illustrated in Figure 2. For example, options such as undertaking proactive output/outcome-based maintenance may have lower costs than current reactive or preventive maintenance schedules and also have higher benefits.

In the hypothetical country considered in Figure 8, the planners were tasked with reducing journey times between the cities and the ports by 20%. They could identify a number of solutions:

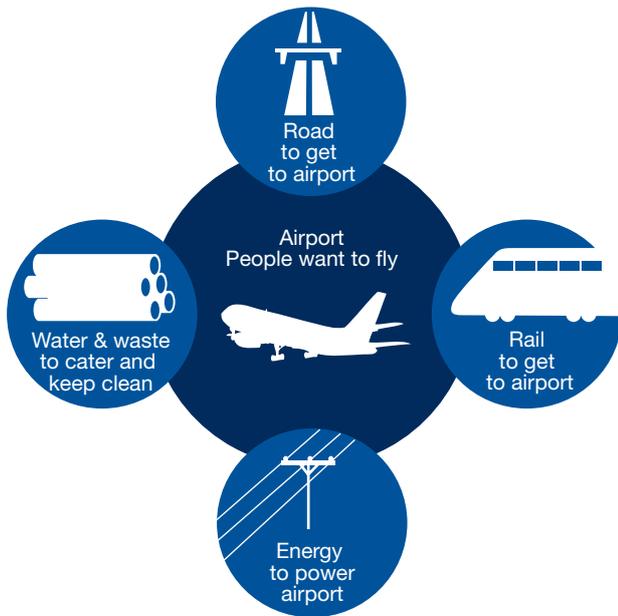
- refurbishing the existing roads and widening the roads at the few key bottlenecks
- designing and building new roads on substantially different routes which would require tunnelling in a few sections and building four large bridges

- building a railway to connect the two cities and the port, thus taking the bulk of the freight off the roads so that the existing roads would require only a little refurbishment and patching
- introducing performance-based highway maintenance contracts and strictly enforcing lorry and truck standards to ensure they are correctly loaded, as an overloaded truck causes significantly more damage to a road than a car
- introducing a tolling system to reduce day-time congestion, charging drivers on the roads between the peak hours of 07.00 and 09.00 and 16.30 and 19.30, and not charging for the remainder of the time.

There is discussion about the time period over which these costs and benefits should be calculated. If there was only one project the evaluation should be conducted over the whole life of that project. This is known as **whole lifecycle cost analysis**. Equivalent terms for **whole lifecycle cost analysis** are **whole lifecycle performance analysis** and the **total cost of ownership**. However, when a range of options are considered there is a need to evaluate each over the same timeframe. For example, if some options have a useful life of 30-40 years (for example the railway lines or roads) and the tunnels and bridges have a useful economic lifespan of 120 years then, in theory, the analysis should be conducted over 120 years. However, as this requires many assumptions for the replacement cost of railways and roads in say 80 years time, and as costs and benefits very far into the future are worth less than costs and benefits over the next few years (because of the **discounting** process that is explained in the Section A.4) in practice an evaluation is made over a long enough period to include most of the costs and benefits, maybe 40 years in this case. Which will only require assumptions about what the value of the tunnels and bridges will be at the end of 40 years. Different countries have different guidance on what period projects should be evaluated over.

Step 4: Ensure the infrastructure is interconnected for each of the potential solutions. Infrastructure is not **functional** unless it is correctly connected to other infrastructure. Therefore, interlinkages and **interdependencies** with other infrastructure networks should be considered when developing new projects. If a new airport is going to be built, for example, what supporting **economic infrastructure** is needed to make it **functional**? Figure 9 illustrates additional infrastructure that may be needed although, if most air passengers arrive by road transport, the rail project may be regarded as a “*nice-to-have*” that can be phased in later.

Figure 9: Economic Infrastructure Interdependencies for a New Airport



In addition to ensuring infrastructure is interlinked, governments should consider whether infrastructure networks can be bundled together. For instance, it may be more cost-effective to lay gas and water pipes in the same trench rather than in two separate trenches. However, the cost savings need to be balanced against the higher risk that both services could be interrupted if there were an accident/incident along the joint network.³⁰ There are also national security reasons for having robust, resilient infrastructure.

- **Step 5: Summarize possible solutions.** The outcome for each of the specific infrastructure problems will be a clear understanding of what will happen to the infrastructure if nothing (**do nothing**) or the minimum (**do minimum**) is done. A range of possible costed solutions to address each of the identified infrastructure goals will have been identified and documented, each properly interconnected to other infrastructure networks to maximize synergies.

At this point, any solutions that are clearly unfeasible (maybe because they are much more expensive than other options and seem to offer no further benefits, or would not comply with environmental and safety laws) can be rejected, leaving a short list of four or five potential solutions to each specific infrastructure deficiency.

A.4. Stage 4 – Finalizing the Best Solution for Each Infrastructure Deficiency

Key points

- It is recommended that cost benefit analysis is used as a way to fully consider the long-term economic, environmental and social implications of infrastructure investments
- To reduce allegations of manipulating cost benefit analysis to justify government actions the assumptions in cost benefit analysis should be transparent
- Potential investors who see evidence of credible cost benefit analyses are more likely to consider tendering for government projects

The result of the infrastructure needs analysis could leave the government with a number of infrastructure issues and deficiencies it needs to focus on and resolve in the next few years. Rather than government departments lobby for projects with uncertain impacts, and confirm that the deficiencies identified are the most pressing, a number of objective methodologies are available to help governments decide which project solutions are best value for money. These include **cost benefit analysis (CBA)**, **cost-effectiveness analysis** and **input-output analysis** among others. Each of these prioritization methodologies has advantages and challenges, but the CBA methodology is most commonly adopted to select projects because it is flexible and in most instances attempts to summarize the benefits and costs in one monetary amount.

CBA of projects is also often required to secure loans and support from MDBs. Further, potential investors and participants who see evidence of credible CBAs will have greater confidence and willingness to consider tendering in projects.

Governments are therefore recommended to prepare CBA methodologies or adopt an existing methodology. Despite its theoretical underpinnings, the tool can be made quite easy for planners to use with sufficient training and easy-to-follow guidance. However, planners must be transparent in all their CBA assumptions as there are unfortunate instances where governments decide on a preferred solution and then formulate, or "**back-solve**", a CBA to create the response they want. Therefore, as well as adopting best practices, governments should use independent forecasts to reduce the risk of optimism bias. For example, they can ask an external adviser to undertake a critical review of their own forecasts.

This section explains how CBA is undertaken. Appendix 6 provides more technical details and explains two other approaches, **cost-effectiveness analysis** and **input-output analysis**, in greater depth.

Comparison of the Way Private Companies and the Government Evaluate Infrastructure Projects

The principal objective of private-sector companies is to maximize the financial returns from investments while satisfying regulatory and other requirements; their aim is thus to maximize the ratio of:

$$\frac{\text{Sale price of asset}}{\text{Cost to make the asset}} \quad \text{or} \quad \frac{\text{Revenues from service}}{\text{Costs to supply service}}$$

The costs will include the total costs of making the asset or supplying the service as well as the costs of complying with laws and regulations and the charges that may be applied on CO₂ emissions and the like. From purely a profit viewpoint, the private sector does not need to consider the external costs it imposes on others if these are not priced; for example the noise an activity may create.

While in theory, to maximize profits, the private sector should evaluate the financial returns of a project over its whole lifecycle (**whole lifecycle cost analysis**), the sector sometimes focuses only on those projects that give a payback in the shortest possible time.

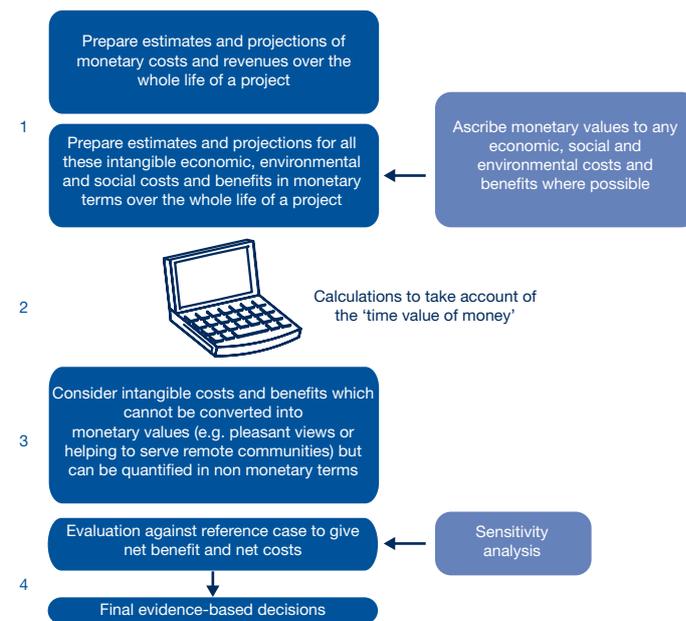
Governments, on the other hand, need to take account of their wider responsibilities to make decisions on behalf of society and, in so doing, incorporate financial, economic, social and environmental issues into project decisions. For example, governments should encourage investment, growth and job creation, and in taking a long-term view, act as the custodian of the environment for future generations.

Therefore, government responsibilities should be to try to maximize the combined net long-term economic, social and environmental impacts of its actions and investment decisions, even if some of the impacts are not priced by the market. Put another way, for a given level of benefits, governments should try to minimize the **total cost of ownership** taking account of economic, social and environmental impacts. For instance, while a water sanitation project in a peri-urban area may not be commercially attractive (it would not make a positive financial return), the improvement in health benefits to the community may make the project deserving of government support for a range of economic and social reasons.

Four Stages of Cost Benefit Analysis

The four main stages required in CBA are summarized in Figure 10. Appendix 6 provides further detail and an example of the calculations that are necessary.

Figure 10: Four Steps of Cost Benefit Analysis



Cost Benefit Analysis for Each of the Focus Areas

To make final decisions on which projects to focus on in the next few years the central infrastructure unit will need to be provided with comprehensive CBA reports for each of the identified infrastructure deficiencies. Each will discuss the long list of options to address the deficiency (Section A.3), the process and rationale to reduce to a shortlist of four or five options if this was necessary, detailed analysis of these shortlisted options and a clear recommendation as to which of the shortlisted options are best value for the taxpayer. So, if seven or eight deficiencies have been identified, the government will require seven or eight separate CBA reports that recommend a preferred solution for each identified deficiency.

At this point it is acknowledged that the business cases that have been developed will not be detailed enough for the project to move directly into procurement as further detailed work will be required in the **project preparation phase**. Section A.7 provides further explanation.

A Gradual Convergence of Private-Sector and Public-Sector Evaluation Processes?

With increasing government regulation, companies are being required to consider the longer-term impacts and **whole lifecycle costs** of projects, both from their own cost perspective and also from the government’s perspective. Governments are also starting to create markets for environmental impacts that previously would not have been considered by private companies in their **whole lifecycle cost** analysis. For example:

- more and more countries are creating markets that price CO₂ emissions, with some construction companies choosing different construction materials that have lower CO₂ footprints
- governments are imposing stricter limitations on what can be disposed of which is reducing the amount of waste in the construction industry and encouraging the recycling of old construction materials.

In addition, government procurement policies are increasingly asking companies bidding for public tenders to include qualitative and quantitative information about the environmental performance of their products and of their company, and are taking these responses into account when choosing a preferred partner. Therefore, consideration of non-monetary costs and benefits is slowly becoming more important for these companies.

A.5. Stage 5 – Deciding Who Should Pay for Infrastructure

Key points

- To help reduce the infrastructure gap projects that can be paid for and funded by users should be encouraged unless they are not aligned with the government's economic, industrial, social and environmental policies. For equity and economic reasons, subsidies can be given to those individuals who are not able to afford essential infrastructure services
- Central government should then focus on those non-commercial projects that create the greatest impact in terms of economic growth, social uplift and sustainability

The Background section has already emphasized that where aligned with the government's economic, industrial, social and environmental policies, consumers should be charged for actual infrastructure use (e.g. electricity consumption or water consumption) because:

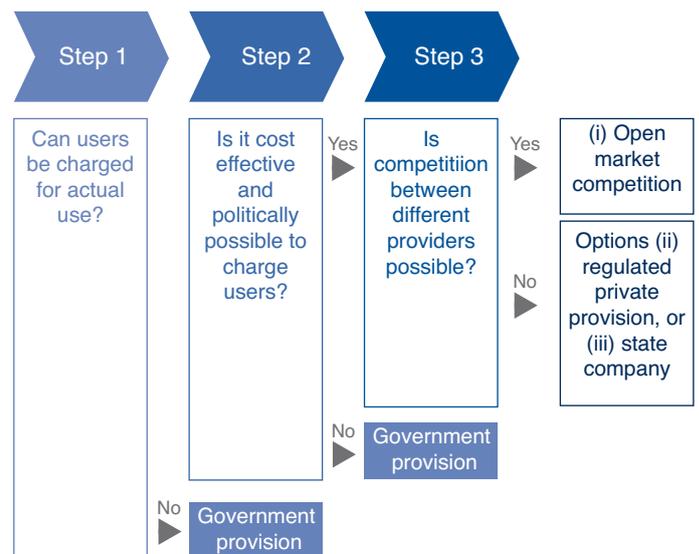
- it is not equitable for people who do not consume the service to pay for it through their taxes unless the infrastructure brings significant wider benefits to society. For example, it is inequitable for rural populations who lack access to potable water to pay, through their taxes, for city dwellers to have tapped water. On the other hand, it can be argued that taxpayers should contribute to the building of an airport if the airport results in many tourists visiting the country
- inefficiencies arise when no incentive to restrict consumption exists. For instance, households are likely to over-consume water or leave taps dripping if they do not have to pay for usage.

This section focuses on the delivery options available if user-charging is possible and discusses some of the pros and cons of state versus private provision. Section B.1 goes into further detail about alternative procurement routes open to the government if user-charging cannot be introduced.

Mixed user-pay and taxpayer-funding solutions are also possible. For example, in cases where a small amount of government support is needed to make the projects commercial subsidies can be considered. As an illustration, governments may need to offer grants to accelerate the installation of solar panels. Also, when moving from taxpayer-funded to user-funded provision there may be groups of society who cannot afford essential infrastructure services; in these circumstances these users should be subsidized. This can be done by requiring companies to cross-subsidize those unable to pay with higher charges for those who can pay. However, this can distort the market, particularly if subsidies start to become a material amount of the operators' income. A better solution is for government subsidies to be paid through the welfare system, or paid if the operator meets certain output targets.³¹ A World Bank Technical Paper explains user-charging and subsidy issues in detail, and provides a case study where Chile moved from a system of cross-subsidies for water to a welfare-supported subsidy system for those least able to afford water.³²

Figure 11 illustrates the three questions or steps that need to be addressed to decide whether user-pay methodologies can be adopted and what user-pay options are available.

Figure 11: Questions to Determine the Appropriate Model for User Charging



The four solutions (no user-charging, user-charging with open-market competition, user-charging with regulated private provision and user-charging by a state company) need the caveat that, while the answers to the questions will give a general indication of which type of contacting mode is better, they are not firm recommendations as solutions will vary on a case-by-case basis.

Answering the three questions in turn:

- **Step 1: Can users be charged for actual use?** In some cases this is not possible as it is difficult to define who the users are. For example, storm drains reduce the chance of streets flooding by taking run-off water from buildings and roads into underground pipes. However, it would be hard to define who the users of the storm drains would be – would it be the property owner whose residence is not flooded, the vehicle owner whose car is not damaged or the sick patient who is able to be taken quickly by ambulance to the hospital along uncongested roads? Another illustration could be a town resident who has a higher quality of life as a result of a bypass being built, even though the resident never needs to drive on the bypass.

Other types of infrastructure have very large social and environmental benefits but fewer economic benefits, so they need government support. For example, a flood barrier at an estuary has many social and environmental benefits but it may not be provided without government support.

- **Step 2: Is it cost-effective and politically possible to charge users for actual use?** It may be technically possible to set up road user-charging throughout the country, but it may not be cost-effective to do so, as it may require installing GPS trackers in every vehicle. In other cases, it may prove politically difficult to start charging users for infrastructure use. For example, even if it was cost effective to install GPS trackers in every vehicle this could raise ethical concerns about people's movements being tracked by government.

- **Step 3: Is competition between providers possible?** The Introduction to this Report emphasized that most infrastructure has high capital investment costs in relation to its operating costs and, once built, infrastructure is difficult to move to another location. This means barriers to entry are high and monopolies would be expected – i.e. the first company or organization to build in the area is likely to become the dominant player. Without regulation, the resultant monopolies would have the power to charge users high prices as there would be no alternative supplier.

(i) Open Market Competition

Nonetheless, where there is general legislation to prohibit cartels and other forms of anti-competitive practices then, for some types of infrastructure, especially infrastructure that requires no cross-subsidies, (i) open market competition can occur. Examples include countries where there are three or four mobile phone operators, as the comparative costs of setting up the base stations and running a network are not prohibitive. Another example is a train line that runs parallel to a canal where the railway could compete against the canal for freight haulage. Economic evidence shows that consumers nearly always win in competitive markets as efficiencies are gained.³³

The government has two delivery options in cases where monopolies are the natural result and/ or where there is a need for large cross-subsidies (as opposed to targeted welfare subsidies): regulated private markets or provision through a state company.

(ii) Regulated Private Provision

In effect, government regulations attempt to substitute for market competition and remove potential distortions that large subsidy components can create. Governments regulate private providers by setting price caps, minimum standards or other rules, and sometimes enforce “open book” accounting. “Open book” accounting can be used to better understand profit levels and how cross-subsidies are used.

There are two main regulatory solutions, notably:

- the government lets the private sector build, finance and operate the **economic infrastructure** and monitors its performance with a regulatory body. There are two main regulatory approaches; price-cap and rate of return regulation, although mixed solutions are also possible. With price-cap controls the regulator sets the maximum unit price the company can charge for services over a defined period of time, whether this is a price per kilowatt of electricity or a price per litre of water, allowing the company to make higher profits if it is able to improve its efficiency. Price-cap controls provide powerful incentives for the operator to be efficient but they tend to lower the quality of services provided as the operator does not gain anything by improving quality levels. With rate of return regulation, the government controls the returns the private sector can make, allowing unit prices to be set to allow these rates of return. This encourages the private sector to propose many quality improvements to increase its total profits, even though the rate of return is constrained.
- the government owns the assets and tenders out a leasing **concession** to operate the **economic infrastructure**. A **concession** is an arrangement whereby a public party, usually the state, gives a third party the right to use land or property for a specific purpose and for a specific period. As it is a contractual approach, a regulator is not necessary.

Many acronyms are used to describe concession models, including DBFO, DBO, DBOT, BOO, BOT, BOOT and BLT. Box 6 indicates what each letter stands for.

Box 6: Terminology Used for Defining Different Concessions

B	Build	L	Lease
D	Design	O	Own or operate
F	Finance	T	Transfer

Source: Based on World Economic Forum, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010. p.172

As the concessionaire can vary the costs (e.g. changing the staffing complement) and the revenues (subject to any price ceilings or controls), the tenderers will offer the government money to run the concession. Such models are also very useful where subsidies are necessary (e.g. when costs are very high and revenue opportunities are lower as happens on some rural railway lines), as there will be competition around which potential concessionaire requires the lowest upfront or annual subsidy. Having secured the concession, the tenderer will operate the assets commonly for seven to 15 years to give it sufficient time to recoup its monies.

With this contractual structure, the government retains ultimate ownership of the assets and a right to terminate the contract should conditions not be met, giving it greater flexibility. This approach can be thought of as a “*partial privatization*”, where society benefits from the efficiencies the private sector can bring but the government retains ultimate ownership of the asset. Because of this, **concession** modes span both user-pay models, but also some of the government procurement models discussed in Section B.1.

The World Bank has developed a Body of Knowledge on Infrastructure Regulation (**BoKIR**) which provides further guidance on regulatory options when there are infrastructure user charges.³⁴

(iii) Provision through State Companies

As a generalization, governments’ core competencies are making laws and regulations, setting and collecting taxes, providing a social security net and ensuring government monies are spent as effectively as possible. However, in many jurisdictions, state companies are often responsible for providing utilities and railways, and charge users.

Which Is Better for Consumers – Regulated Private Provision or Provision Through State Companies?

If the ultimate result is a monopoly, there is some debate over which is better for consumers – regulated private provision or provision through state companies. No definitive answer exists, but Figure 12 lists some of the factors to be considered.

Figure 12: Indicators for State or Regulated Private Provision

	← Range →			
	State company			Private company
Accounting rigour				
– Accounting systems - requirement for state companies to account for all government loans and properly depreciate assets	High			Low
– Central government's scrutiny and rigour when evaluating state company requests for money	High			Low
Flexibility				
– Employment issues - ability of state companies to attract talent	High			Low
– Independence of the state company from politically motivated changes and special interests	High			Low
Role of regulators				
– Ease for regulators to understand the cost structure and enforce compliance, especially if there are cross-subsidies	Low			High
Governance				
– Degree of petty state corruption	Low			High
– Shareholder checks and balances to control management	Low			High
– Effectiveness of judiciary in stopping misappropriation of assets	Low			High

If state companies can be incentivized to operate like private companies, use recognized private-sector accounting practices, are able to secure finance when needed, have the ability to attract the right talent, and are left to operate largely independently from political control they may be a better solution as they can borrow money more cheaply.

However, evidence shows state companies are rarely able to operate in such a way, with Gray stating that in the infrastructure sector, “the available evidence confirms the powerful effect private participation can have in expanding access and improving service quality.”³⁵ However, Gray also states that the evidence that private provision always results in lower prices is actually ambiguous as it depends on, “the degree of subsidies that were in place prior to privatization, and the degree of competition and the effectiveness of regulation post-privatization”.³⁶

Case Study: State-owned vs. Privately-operated Infrastructure



“State capitalism’s most obvious achievements are in infrastructure. China has produced a large number of world infrastructure records, such as the largest hydroelectric project, the Three Gorges dam, and 6,400 km of high-speed rail. It has also scattered new airports and railway terminals across the land. Even Russia’s more rough-and-ready railway system works pretty well, despite punishing weather.”

“There is striking evidence that state-owned companies are not only less innovative but also less productive than their private competitors. The Beijing-based Unirule Institute of Economics argues that, allowing for all the hidden subsidies such as free land, the average real return on equity for state-owned companies between 2001 and 2009 was -1.47%.”

Source: The Economist. *Emerging-market Multinationals: The Rise of State Capitalism: Pros and Cons Mixed Bag*, 21 January, 2012.

In conclusion, both state provision and private provision have benefits. The best solution depends on the particular circumstances and the powers of the regulator if needed. Examples of successful public ownership of assets do exist, such as France’s Areva, which is 87% owned by the French government,³⁷ or Scottish Water, which is regulated by the Water Industry Commission for Scotland. Likewise, examples of successful privately owned infrastructure providers exist, such as Sydney Airport in Australia, which operates under a 50-year **lease** with the option to extend for another 49 years, and the privatized Grupo Sureste, which operates nine airports in Mexico under a 50-year **concession**.³⁸

A.6. Stage 6 – Finalizing the Plan

Key points

- Even if user-charging becomes more common because of affordability constraints, some government-funded projects that would be beneficial to society will not be able to be funded due to a lack of resources
- Government budget cycles should be lengthened beyond one year so departments and ministries have the opportunity to pursue big projects if these offer society the best value for money
- Master plans are an effective way to visualize the timelines of plans

This section explains how the final choice of projects is made. Appendix 8 provides further detail and a practical step-by-step guide on how this process is done in the United Kingdom and in Australia. The section concludes with evidence about what makes a successful infrastructure plan.

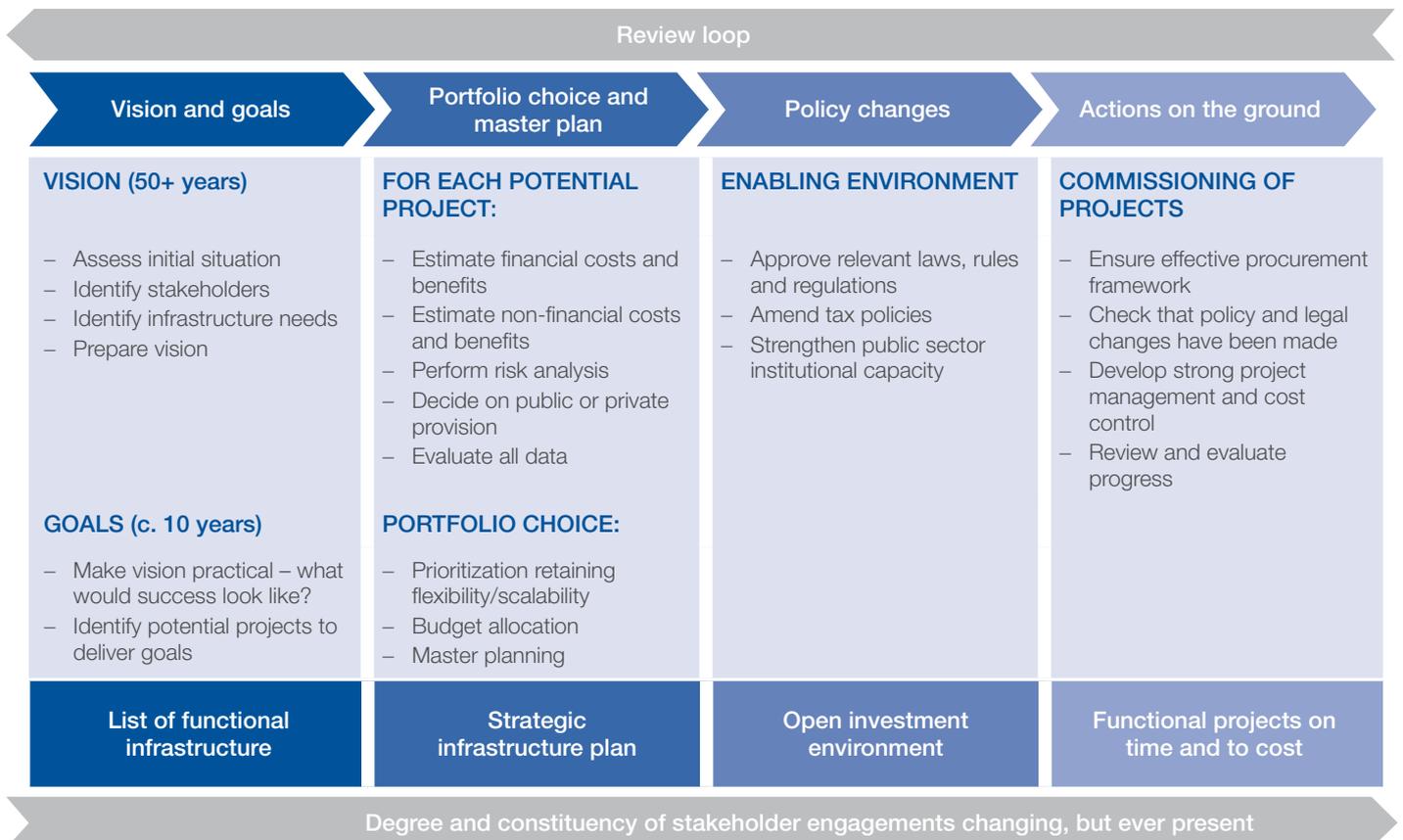
Figure 13 expands on the methodology in Figure 3, and summarizes the approach recommended for preparing an infrastructure plan. It is based on the methodology the United Kingdom government has adopted. Sections A.1, A.2, A.3, A.4 and A.5 have explained how the **infrastructure vision** and **infrastructure goals** have been determined and how lists of possible projects to deliver some of the medium-term **infrastructure goals** have been identified and evaluated. This section considers the portfolio choice decisions and the **master planning** methodology shown in Figure 13.

Step 1: Sense check plans

As stated in Section A.4, for each of the identified areas of infrastructure need in a country, a CBA should be prepared that recommends a particular project option that is deemed value for money, maximizing the economic, social and environmental impacts.

As explained in Appendix 6, the government needs to ensure that each of the CBA reports has been prepared in a consistent way, that they are robust and have reasonable sensitivity assumptions to understand the main risks in greater detail. For example, due to the **planning fallacy** many individuals and planners routinely underestimate how long it takes to undertake tasks or how much the maintenance costs will be. People also give different answers if asked the same question slightly differently – a case of response bias.

Figure 13: From Infrastructure Vision to Action



Source: Based on HM Treasury, *Strategy for National Infrastructure*, March 2010, p. 26.

Step 2: Decide Which Project is Best for Each Challenge/Deficiency

Once the government has reviewed each CBA report, it must confirm that the recommended project represents best value for money. If the government has been uncertain about which identified infrastructure deficiencies it will address in the next few years it will have prepared a larger number of CBA reports and this Step 2 process will then determine which are the most appropriate deficiencies to address first. If the government has been more certain about which deficiencies to address first, this Step 2 process will result in fewer projects being deselected.

As illustrated in Figure 14, where all costs and benefits can be monetized, projects have been evaluated over similar time periods, and the government has a cash constraint, the chosen project/s will be the one/s with the highest **benefit/cost ratio/s (BCR/s)**. The BCR is the ratio of additional benefits above and beyond the **reference case** to the additional costs above and beyond the **reference case**. Where some costs and benefits cannot be valued in monetary terms, the perceptual **multicriteria analysis** highlighted in Section A.4 will be undertaken, but even here BCRs can still be used as an aid to final decision-making.

With the list of projects ranked by BCRs and a known government affordability envelope, the government should:

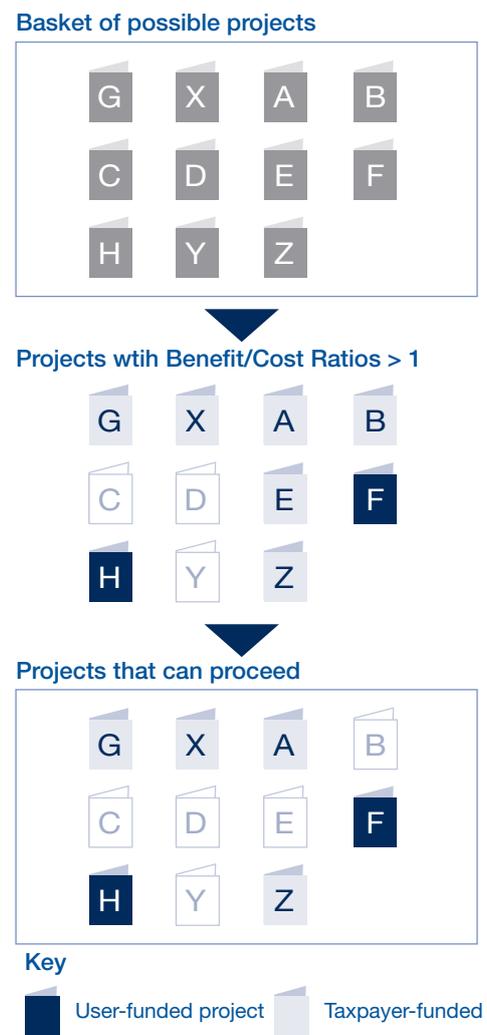
- select those non-commercial projects (i.e. those that would not give a commercial operator a reasonable positive financial return) with the highest BCRs above 1.0
- approve, subject to appropriate safeguards, any commercial user-funded project with a BCR above 1.0.

In this example, beyond the money that has been set aside for routine maintenance (**do minimum**), the government is assumed to have available funds of US\$ 100 million and chooses government-funded projects X, G, Z and A. It is then left with funds of US\$ 4 million, which can be used the following year. Even though project D costs only US\$ 4 million, it should not invest in this project as it has a BCR of less than 1.0.

Three projects identified would make positive financial returns and could be provided commercially, but only projects H and F have BCRs above 1.0. The government should allow and facilitate investment in these two projects. Although Project C would make its investors a 10% return, it should not be approved as it has a BCR of 0.90. Project C could be a proposal to build a gas pipeline through virgin rainforest, which would give the investor a 10% return but would result in environmental degradation, the disruption of animal migration patterns and negative impacts on indigenous communities.

As illustrated in this example, the government would like to invest in two projects (Projects E and B) but cannot due to a lack of government funds. Nevertheless, the government departments recommending and promoting Projects E and B may still be able to lobby the Ministry of Finance/Treasury, highlighting the aspects that are beneficial to society. If they can convince the Ministry of Finance/Treasury that their projects have more to offer than other government initiatives, for example proposals to increase social security and welfare payments, these projects may be approved.

Figure 14: Prioritization Steps



Project	Benefit /Cost ratios (BCR)	Priority	Financial return	Cost to government (US\$ million)	Government's available funds (US\$ million)	Project proceed
					100	
X	2.5	1st	-50%	30	70	■
H	2.3	2nd	30%	0	70	■
G	2.15	3rd	-11%	18	52	■
Z	1.6	4th	-15%	33	19	■
A	1.55	5th	-50%	15	4	■
E	1.4	6th	-20%	25	4	
F	1.2	8th	25%	0	4	■
B	1.05	9th	-15%	40	4	
Y	0.95		-30%	25	4	
C	0.9		10%		4	
D	0.85		-30%	4	4	

Step 3: Make Government's Budgeting Cycle Flexible Enough to Deliver the Best Projects

Government's budgetary systems may limit the public sector's ability to choose the best solution. Although governments create fiscal projections for the years ahead, they often prepare their budgets on an annual cycle. Monies may then be allocated to each department or ministry annually based on the requests each department or ministry makes, or the allocation may simply be the previous year's budget plus or minus a fixed percentage share. For example, if the overall fiscal budget needs to be trimmed by 2%, every department/ministry may be subject to the same 2% cut and told to optimize its budget within that ceiling.

As shown in Appendix 9, longer departmental/ministry budgeting cycles (e.g. two- or three-year budgets as opposed to annual budgets) often enable projects with the greatest impact to be selected.

The recommendation is therefore that governments budget for longer periods of time. This will enable better projects to be proposed and will reduce the amount of annual internal bureaucracy as ministries and departments vie for limited fiscal resources. Having longer budgeting cycles will also reduce instances where one procurement solution is chosen over another procurement solution purely for cash flow timing reasons.

Step 4: Devise a Master Plan

By having a longer budgeting cycle and also by giving "*in principle*" approval for projects for a few further years beyond the budget cycle potential bidders, investors and sub-contractors should have greater confidence that the infrastructure plan will be delivered. With approved budgetary plans for the next few years and an indication of which projects will follow in later years, a future-looking nationwide **Master Plan** can be prepared.

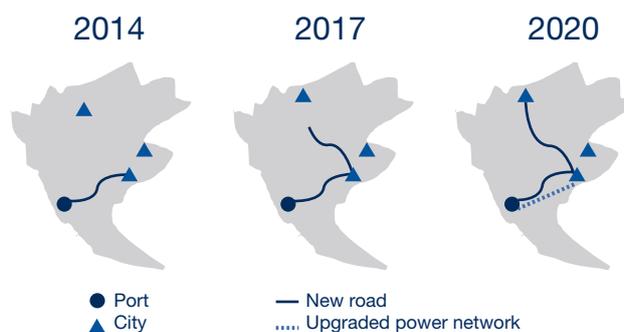
The definition of a **Master Plan** is open to a wide variety of interpretations. It is a term used extensively by town planners who tend to categorize plans as either:

- Development plans, which are outlines that set the project's scale and the characteristics of a large area, whether that be a city or a region
- **Master plans**, which are detailed and entail a greater degree of certainty.

For the purposes of this report, a **Master Plan** is defined as a blueprint for a city's, a region's or country's future infrastructure requirements. It should cover seven to 10 or more years and provide a chronological vision for how infrastructure is developed over time. **Master plans** can also be used to guide national decisions on other matters as well, such as the provision of **social infrastructure**.

Figure 15 provides a simplified example of what a **Master Plan** for a country might look like. The plan explains in more detail the routes for roads and the requirements to upgrade power networks. Behind the **Master Plan** for the country or region, there may well be a **Master Plan** at the localized level; for example, one for a port expansion. At whatever geographic scale a **Master Plan** is prepared it will not be as detailed as the architectural plans that construction companies use for building projects.

Figure 15: Example of Master Planning



Creating a **Master Plan** for a whole country requires considerable preparation, and to date the best examples of **Master Planning** remain at the town/regional levels.

Step 5: Maintain Flexibility in the Plan and During Execution

It is normally cheaper to build a project in one stage than in several phases. Nevertheless, building in phases creates an option – a **staging gate**. When the first phase is complete, governments or the private sector can reflect on progress before deciding whether or not to invest in the second phase. For example, it is often sensible when building an airport to start off with less ambitious designs and ensure that the designs and plans have sufficient adjacent land to allow for **future scalability** when demand warrants. If governments believe that demand in 20 years' time may be 200 flights a day, it may make sense to build Phase 1 to accommodate 50 flights a day, and defer the Phase 2 decision and investment for a number of years. In this way, even if during the Phase 1 building stage, the 20-year demand projections drop to 75 planes, the Phase 1 airport can still be opened, with assumptions and projections reassessed in a few years' time to then determine if the 75-flights a day projection is still realistic or an under- or overestimate.

Measures of Success for Preparing Plans

The Background explained that the concept of preparing an infrastructure plan is still comparatively new. Four **economic infrastructure** Plans from Australia, Mexico, the Province of Ontario in Canada and the United Kingdom have been reviewed and six measures of success noted:

- **Clear scene-setting of the current condition of infrastructure:** As explained in Section A.1, the preparation of infrastructure asset registers enables countries to understand the condition of their infrastructure assets and whether the quality of infrastructure services is improving or deteriorating. Examples include whether processing times in airports and ports are becoming faster and how much congestion there is on roads.
- **Stakeholder involvement:** As an infrastructure plan should be robust, the greater the degree of stakeholder buy-in the better. The following example in Panama shows that if the government has real engagement, plans will have much greater support.³⁹

The importance of proper stakeholder engagement



We have to be patient...., we have to explain, we have to teach, but more important than anything else is that we have to be consistent with what we are saying and what we are doing. So that that is the only way we can win the trust of the people....



Alberto Alemán Zubieta, Administrator of the Panama Canal, 28 February 2007

- Complete overview of sector: To be all-encompassing, the infrastructure plan should prioritize privately owned infrastructure as well as publically owned infrastructure.
- Politicization of plans: Infrastructure plans have been criticized for being political marketing documents, with some commentators suggesting that actual prioritized projects appear to lack a robust CBA, or their apparent precision has been fudged. Rather, what has been included are projects recommended by Ministers. Therefore, the more transparent and open government can be about why it has chosen some projects over others, the better. As well as the greater politicization of plans, there is also a tendency for politicians to prefer large new projects over smaller or simpler projects that generate greater impact.

Often maintaining assets creates the best Value for Money



.... inadequate maintenance imposes large and recurrent capital costs. For instance, paved roads will deteriorate fast without regular maintenance. Likewise, insufficient maintenance of a railroad system will lower its reliability, causing delays for travellers when parts of the system break down. Unfortunately, policy-makers have a perverse incentive: given their higher visibility, new public investment projects are politically more attractive than economically crucial....



Romp, W. and J. de Haan, *Public Capital and economic growth: a critical survey*. European Investment Bank Papers Volume 10, Number 1/2005, p 58.

- Flexible procurement options: Some governments have very regimented procurement practices, requiring a “one-size-fits-all” approach. Standardized contracts and standardized methodologies have many benefits but if the government stipulates that only one procurement methodology can be used, not only are opportunities for innovation removed, but costs tend to be higher. For example, trying to procure maintenance services for a road will require a very different contractual structure than building a new airport or installing real-time congestion charging systems. PPPs⁴⁰ are discussed in more detail in Section B.1, and the PPP policy of the government of the United Kingdom is generally regarded as balancing the competing requirements of the efficiency of one standard contract while allowing changes for project-specific reasons.⁴¹ The World Bank has guidance for procurement, for example the material and reports contained within the Public-Private Infrastructure Advisory Facility website⁴², as does the Inter-American Development Bank⁴³ and others.
- “Power” of the Unit to approve and stop projects: An infrastructure plan is of little use if the infrastructure planning unit has little “power” to prioritize projects and government ministries or local municipalities continue with their own procurements irrespective of what the planning unit recommends.

A Comparison of The Four Plans

Against the six success factors for formulating **economic infrastructure** plans, Figure 16 summarizes the main differences between the four infrastructure plans proposed by Australia, Mexico, the Province of Ontario in Canada and the United Kingdom (see Appendix 10 for further detail).

Figure 16: Comparison of Infrastructure Plans in Australia, Mexico, the Province of Ontario and the United Kingdom

	Australia Infrastructure Plan	Mexico Infrastructure Plan	Province of Ontario Infrastructure Plan	United Kingdom Infrastructure Plan
Scene-setting				
-Infrastructure asset registers being prepared	●	○	●	●
Stakeholder involvement				
– Stakeholder involvement at prioritization stage	●	●	●	●
– Stakeholder involvement at delivery phase	○	○	●	○
Prioritization approaches				
– Prioritization of taxpayer-funded infrastructure	●	●	●	●
– Prioritization of user-funded infrastructure	●	●	○	●
– Clear rationale for prioritizing projects	●	●	●	●
Flexible procurement options	●	●	○	●
“Power” of the Unit to approve/stop projects	●	●	●	●

Key

● Yes ● Partly/limited ○ No

Based on these success factors, none of the four plans meets all the criteria in full. The following points are relevant:

- Australia, the Province of Ontario and the United Kingdom are all creating databases of their infrastructure assets or gathering information on the quality of infrastructure services
- No country or province has undertaken significant stakeholder consultation, although after the Province of Ontario approved the plan it has regular meetings with contractors
- Only the United Kingdom has undertaken a full analysis of what infrastructure it wants the private sector to provide, and only Australia appears to have a clear rationale for prioritizing projects, although some commentators have stated that the exercise has been managed for political purposes
- Australia, Mexico and the United Kingdom have different procurement approaches that vary depending on the type of project. However, the Province of Ontario has been criticized for having a standard procurement system that delivers questionable value for money, although it does mean projects can be procured and building works commence very quickly
- The Province of Ontario appears to have the most control over its infrastructure plans, approving or rejecting proposals, although the actual delivery is funded and delivered at municipal levels, by other provincial ministries and for larger projects by the Infrastructure Ontario government agency.

As most of these plans are recent, it must still be definitively proven that the plans have created long-lasting benefits. However, what is clear is the plans have increased confidence in project pipelines and have created a more objective base from which to analyse future requirements.

A.7. Stage 7 – Moving from Planning to Action

Key points

- Given the importance of an infrastructure plan to investors, contractors and society at large, the plan should be properly marketed
- Preparing the plan is only the first step to then making policy changes and committing monies to undertake the detailed project preparation to get projects tendered and actually built/maintained

Once projects have been prioritized, the plan will need to be published and marketed to stakeholders and potential investors, policies may need to be altered, organizational changes made and detailed project preparation work commissioned to get projects ready for tendering. These are the policy change and action components of Figure 3 and Figure 13.

Step 1: Publishing the Plan

In some countries before plans or policies are published a draft of the plan or policy is made available to interested stakeholders for their review and comment. Stakeholders then have one or two months to make their final comments. The government can use this review process to validate some of its assumptions and, if possible, address unresolved issues.

The process of launching a draft and the final plan will need a marketing process to:

- explain the results of the prioritization to stakeholders and wider society to help secure their buy-in. It will need to answer such questions as whether the plan helps to reduce congestion, decreases power prices, results in the building of a new airport opening up new travel destinations and markets, or improves water quality. Criticism from stakeholders, especially those who were involved in any stakeholder engagement exercise, must be managed with sensitivity
- explain the results to all the government departments, some of which may have had projects delayed or cancelled in favour of better value for money solutions
- promote the plan to investors, construction and engineering companies and other participants to stimulate market interest.

Step 2: Policy Changes

To encourage investment in infrastructure, it may be necessary to change certain policies to address three parameters included in the government readiness metrics of the **Strategic Infrastructure Planner Framework**, notably:

- **The rule of law and effectiveness of law-making bodies.** Regulations on government procurement may be needed, such as PPP laws. The aim is to ensure that the legal framework is clear, consistent and predictable, and does not conflict with other legislation. For instance, given the current higher costs of solar power compared to conventional power generation, government support is needed to promote investment. The following case study from India provides an example of how the Government and two States have changed policies to foster solar investment. Other examples may include changes to tax policies, or the finalization of cross-border arrangements if infrastructure networks span borders.

Case Study: Policy Changes to Improve Access to Finance - Solar Parks in India

Grid-connected solar power is not commercially viable in India currently. However, the government of India sees a great opportunity as solar technologies improve and costs fall, in particular in the states of Rajasthan and Gujarat, which are some of the sunniest places in the world.

India's 2010 National Solar Mission includes ambitious plans to increase solar capacity from circa 275MW in 2011 (less than 0.15% of India's total installed power capacity) to over 20,000MW by 2022. For larger-scale solar projects, under the Indian National Tariff Policy, there is an obligation for state electricity generators to purchase minimum percentages of their total energy supplies from solar power – notably 0.25% by 2013 and 3.0% by 2022. To complement this, a market for trading solar generation credits has been introduced.

In addition, certain Indian states have their own policies. For example, the State of Gujarat has worked with the Clinton Climate Initiative (CCI) to help structure and design a solar park – an area where interested investors can rent space to install solar panels. The State has secured the land and introduced its own feed-in tariff to support the revenues for solar power generators. With much fanfare, in April 2012 the State inaugurated the world's first solar park with 250MW of capacity (covering an area greater than 20 km²) and there are plans to develop a further 250MW. Investments that were previously deemed untenable have been able to obtain money from Indian banks, multilateral development banks, export credit loans and many equity investors.

Other states are now looking to replicate the model, and Rajasthan has even more ambitious plans to set up solar parks with attached Special Economic Zones to encourage investment from related industries, such as factories that manufacture solar cells, companies that install solar panels, and research and development laboratories.

Sources: Guardian Newspaper. *India Records World-beating Green Energy Growth*. February, 2012. / Clinton Climate Initiative / Ward, M. *Engaging Private Sector Capital at Scale in Financing Low Carbon Infrastructure in Developing Countries*. Asian Development Bank, Published in Cancun November 2010

- Government's openness and transparency. Private-sector companies frequently cite two main reasons they do not tender for government projects in some countries, notably:
 - a lack of certainty in processes, timelines and how tenders will be evaluated
 - biased government procurement decisions.

For example, 465 senior executives involved in infrastructure projects from 69 countries were interviewed. During the interviews they cited a lack of government openness and transparency in selecting bidders for infrastructure projects as the third largest impediment to government effectiveness, and in emerging economies "corruption or misuse of earmarked infrastructure funds is the greatest impediment to more investment".⁴⁴ This is backed up by other evidence; for example, the World Bank reports, "perhaps 25% of electricity production is lost to illegal connections in India, as much as 24% of funds destined for road construction in a project in Indonesia 'went missing' and in the region of 7% of government contract values are paid in bribes, according to the survey respondents in Eastern Europe and Central Asia".⁴⁵

To address a lack of transparency, governments are strengthening laws and giving more power to enforcement agencies. The following case study of the Construction Sector Transparency (CoST) Initiative illustrates an approach to increase transparency by publicly releasing tender information.

Case Study: Openness and Transparency - Construction Sector Transparency Initiative (CoST): Ethiopia

The CoST programme is supported by the World Bank and the United Kingdom Department for International Development and seeks to improve transparency and accountability of publicly financed construction projects. When signing up to CoST, governments agree to disclose agreed winning prices of government-funded construction tenders and the contractors' progress in completing the works; for example, by publishing details in local newspapers. Not only does this enable the government to create a database of construction costs in a country and benchmark these costs with those in neighbouring countries, but it also enables local communities and stakeholders to monitor project progress.

The Government of Ethiopia has signed up to CoST and an in-country Multistakeholder Group has been set up drawing on representatives from key stakeholders. Already by publishing data from a few projects the Initiative is showing early successes and acting as a catalyst for improving governance of publicly funded construction projects. For example, the Government was able to compare tender prices on a 33 km rural road between Gindebir to Gobensa in Southern Ethiopia and negotiate a reduction of 11.5% off the total construction price, making a saving of US\$ 2.5 million - the same as the cost of building a new health facility in an Ethiopian urban area.

Source: Construction Sector Transparency Initiative: *CoST Ethiopia: Briefing Note 10*. July 2011 (updated March 2012)

Civil society also sees openness and transparency as an essential prerequisite for a truly participatory engagement process. Otherwise, civil society may be less inclined to become involved in discussions, resulting in antipathy towards government.

- Government's willingness to engage with the private sector. As well as policy changes to allow the government to procure infrastructure services from private companies or use PPPs, the government may need to change policies to allow foreign investment and ownership.

Other enabling legislation and policy changes may be needed to address some of the other parameters from the **Strategic Infrastructure Planner Tool**; for example, laws to allow foreign banks to enter markets, the liberalization of foreign exchange controls or the privatization of some state-owned companies. Educational policies to increase the number of apprenticeships in engineering skills may also be required.

Step 3: Organizational Changes

In addition to policy changes, a number of organizational, process and procedural transformations may be needed within government to address the following questions:

- Will the infrastructure planning unit have sufficient "power" to prioritize projects?
- What can government do to accelerate project delivery? Internal approval processes within the public sector may need to be reviewed and revised, for example, to ensure that important investment decisions do not get stuck in certain government departments.
- Is it possible to ensure the projects address the necessary economic, environmental and social ambitions? When governments tender projects they can stipulate that they also need to meet a number of environmental and social criteria. For example, governments often stipulate that preference will be given to contractors who employ construction workers and engineers who live near the project. This avoids allegations that workers are brought in to work on a project, leaving few opportunities for locals to learn new skills and increase their employment prospects. Governments could also specify that bidders must ensure that if any natural heritage (for example, a woodland containing rare plants) is damaged, a new nature reserve must be provided – so-called biodiversity offsetting.⁴⁶
- How will projects be reviewed and evaluated? Even where projects are delivered wholly by the private sector or fall under the responsibility of another public-sector organization, it remains necessary for government's infrastructure unit to oversee progress. The unit must also conduct post-project evaluations with a "no blame" approach. Learning points should then be disseminated and systems put in place to replicate successes and overcome any problems encountered.
- What should be done if circumstances change? There are many reasons why infrastructure plans can no longer be delivered to the timescales envisaged. In 2006, for example, the Mexican government prepared its ambitious National Infrastructure Plan. The Plan's implementation has been delayed for two main reasons:
 - the financial crisis has made privately financed infrastructure more expensive and dampened traffic projections for tolled roads
 - various tax reforms that could have increased the financial capacity of the federal and the local governments could not be implemented.

A change in political administration can also mean an infrastructure plan is discarded. However, as stated, if plans have been discussed with a wide group of stakeholders, have a robust evidence-base and there has been a degree of cross-party political support, then new administrations are more likely to preserve the overall direction and vision of the plan, and only make minor changes.

Whatever the reason for changes, infrastructure plans should be "live" documents; if projects cannot be implemented as scheduled, the timelines should be revisited.

Step 4: Making Prioritized Projects “Bankable”

The prioritization process will identify the selected projects and have prepared cost estimates maybe to within a ±10% or ±5% accuracy. For each project there will be a need to complete the **project preparation phase** by conducting more detailed feasibility studies and developing contractual structures. Figure 17 highlights the four main phases in project preparation. In this figure, Phase III (the detailed **project preparation phase**) is the area that requires considerable investment, not only in money, but also in expertise and staff time.

Figure 17: Phases in Project Preparation



The amount of money required to get a project ready for releasing to the market can vary, depending on many factors such as the size of the project, the complexity of the project and the geographical location of the project. For example, a World Bank report provides some estimates of the costs of project preparation for PPP deals stating “the costs of project preparation and tendering should not be underestimated. These costs may typically be 3%-4% of investment costs for projects costing less than US\$ 100 million, 2%-3% for projects costing more than US\$ 100 million, and around 2% for projects costing more than US\$ 500 million (excluding significant costs of land, early works, and environmental impact assessments). As such costs may be disproportionately high, small individual projects are not generally suited to PPPs.”⁴⁷ The costs of finalizing Phase III and IV may be less for **engineering procurement construction (EPC)** contracts (see Section B.1 for more information), but there is also much variation in the costs for project preparation. For example, the G20 Cannes Multilateral Development Bank Working Group on Infrastructure reports “project preparation costs for the Nam Theun 2 hydropower project in Lao PDR, with total investments of US\$ 1.4 billion, amounted to US\$ 124 million, or 9% of investment costs. For the proposed high-profile development of the Inga site in the Democratic Republic of Congo, preparation costs already total US\$ 100 million to date.”⁴⁸

Further, these project preparation costs exclude the costs of final designs, which are often subsumed within contractors’ final prices, but can account for an extra 5%-7% of construction costs.

Given the amount of upfront monies needed, this is one of the main reasons why even prioritized projects sometimes get delayed or cancelled. For example, the MDB Working Group on Infrastructure reports that “More resources are clearly needed for project preparation as practitioners agree that a binding constraint for increased private participation in infrastructure and the realization of regional projects is the scarcity of well-prepared, bankable projects.”⁴⁹

The next phase of the World Economic Forum’s **Strategic Infrastructure** Project will focus on how to prepare and accelerate PPPs. A report will be launched at the World Economic Forum’s Annual Meeting in Davos-Klosters in January 2013 entitled *Strategic Infrastructure: Steps to Prepare and Accelerate Public-Private Partnerships*. By drawing on internationally recognized best practices, it will address in much greater depth the Phase III detailed **project preparation phase**. The report will also explain different approaches to financing the **project preparation phase** such as government or MDB Project Preparation Facilities, including innovative ideas on how to recover incurred costs from winning bidders. However, as explained in Sections A.5 and B.3, ultimately the cost of the project preparation work will be paid for by the final funder – the government or from user charges.

With project details finalized, Section B.4 explains how the project management should be performed so that the selected projects are delivered efficiently and effectively.

Part B

What Should Governments do to Help Ensure Projects are Delivered Effectively and Efficiently?

Key points

- This section makes recommendations for how governments should make the delivery of taxpayer-funded infrastructure more effective and efficient, looking at ways to structure procurements, utilize technology, secure finance, ensure project management practices are appropriate and deal with challenges once infrastructure projects are commissioned

Part B of this Report focuses on how government should deliver the prioritized projects that require government resources more effectively and efficiently, i.e. how government should maximize the value of money of its infrastructure investments. With the exception of discussing **concession** models (see Section A.5), Part B excludes cases where there are user charges, whether or not the assets are owned by public or private companies or require small amounts of government support or subsidies.

In order to represent value for money, the delivery of infrastructure must be effective. If the prioritization process has been done correctly, then to be effective the only challenge is making sure that the specific projects can be structured and delivered in the correct manner to meet their intended objectives.

The delivery of infrastructure must also be efficient - delivering infrastructure that meets its objectives on time and to cost.

In determining the best value solutions, Section B.1 discusses the range of procurement routes governments can choose, which in part depend on whether the infrastructure is already built or not.

As this Report provides general guidance and is intended to be a starting point, Section B.2 gives a brief insight into the opportunities new technologies can create to lower the cost of infrastructure or make assets with longer design lives. Consideration is also given to the benefits that can be achieved by using new design techniques or by introducing standardized building codes.

As stated, with the exception of some **concession** models, even though the ultimate funders will be government and taxpayers, there are nevertheless different options to finance the building or refurbishment of infrastructure, whether it is paid for upfront or if the money is borrowed. Section B.3 explains how to maximize the efficiency and value of financial opportunities.

Section B.4 gives an overview of project management techniques governments can adopt to help ensure selected projects are delivered on time, to budget and meet the ultimate objective of maximizing their impact in economic, social and environmental terms.

As explained in Section B.5, as important as building and commissioning the infrastructure is making sure that the infrastructure is well-maintained and the quality of infrastructure services does not deteriorate over time.



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B.1. Value for Money Procurement of Government-Funded Infrastructure

Key points

- If infrastructure has already been built (brownfield investment), the procurement options are how to manage the maintenance and operations as efficiently as possible
- If infrastructure has not been built (greenfield investment), there are more procurement options available including whole lifecycle cost approaches

This section explains a number of procurement options the government can consider which depend in part on whether the infrastructure assets are already built or are yet to be built. For the purposes of this Report, where infrastructure assets are already built this is termed **brownfield** investment, and where the infrastructure assets have yet to be built this is termed **greenfield** investment. The section concludes with practical solutions to some of the challenges that can arise when projects are commissioned.

Options Where the Asset Is Already Built (Brownfield Investment)

Where the asset is already built, the government can consider three of the **Hierarchy of Quick Infrastructure Wins** options (see Figure 2), notably setting outcome-based service targets, finding ways to undertake general programmed repairs more efficiently or considering demand-side solutions.

Three main maintenance arrangements exist to procure either of these three options:

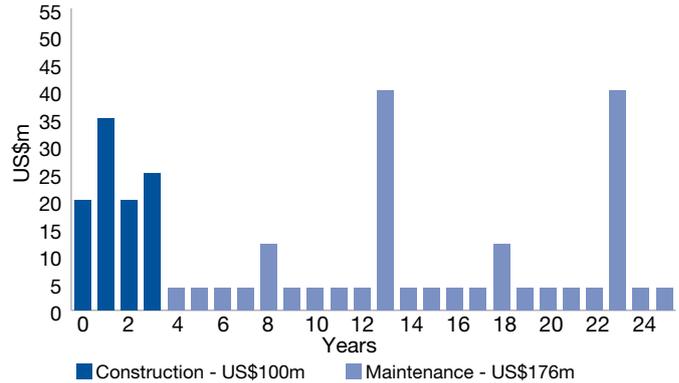
- **Public maintenance.** This maintenance is ideally specified through an outcome-based contract.
- **Outsourcing contract.** Outsourcing is often seen as the first stage towards private involvement in **economic infrastructure**, and a way for governments to market test whether their in-house maintenance services are worth the money. **Outsourced contracts** are typically short-term, commonly one or two years (but can be longer), and are often for the management of discrete infrastructure services.
- **Management contracts.** While outsourcing is for discrete parts of operations, with **management contracts** all operating services are put out to tender. **Management contracts** are generally of two to five years' duration, but can be as long as seven years or more. They give the contractor the ability to manage operational and staffing costs while still meeting defined performance standards. Contractors compete by offering the lowest fee possible to pass all the performance standards. This option is different from a user-pay concession model (see Section A.5) in that contractors cannot influence revenues.

Options Where the Asset Is Not Yet Built (Greenfield Investment)

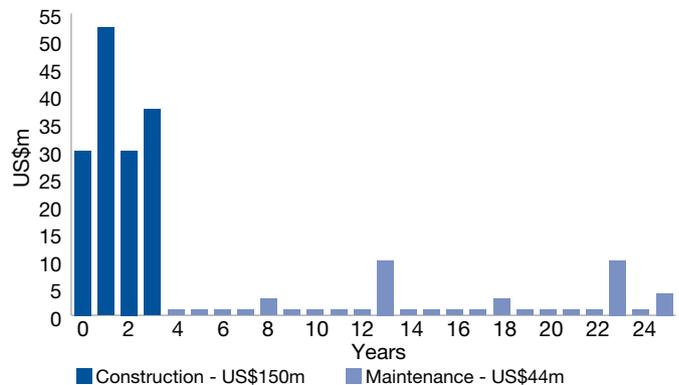
When building any **economic infrastructure**, there tends to be a trade-off between lowering the cost of the building specification (for example, using cheaper, less durable materials) and the costs of maintaining/refurbishing the asset (which tend to be higher/more frequent if less durable materials are used), as illustrated in Figure 18.

Figure 18: Whole Lifecycle Costs - Example of Different Construction Solutions

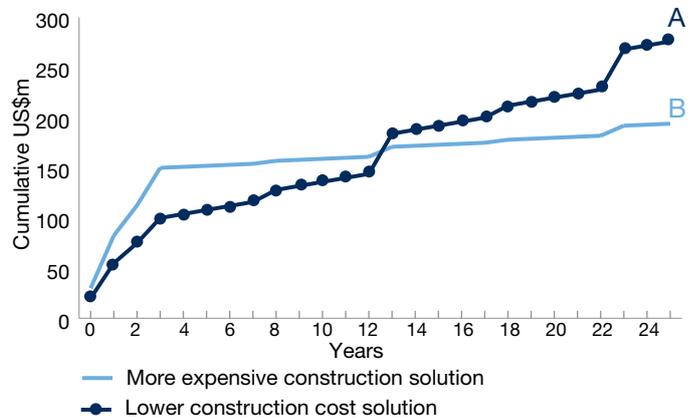
Option (A) - Lower capital cost solution



Option (B) - Higher capital cost (lower total cost of ownership) solution



Cumulative costs of the two construction solutions



If Option (A) is chosen, the asset can be built for US\$ 100 million and the maintenance cost is US\$ 4 million a year in **real terms**, except in every fifth and tenth year when there are higher maintenance costs. If this were a road project, the annual maintenance for spot repairs maybe US\$ 4 million in **real terms**, but higher costs for resurfacing parts of the road would need to be paid in every fifth year.

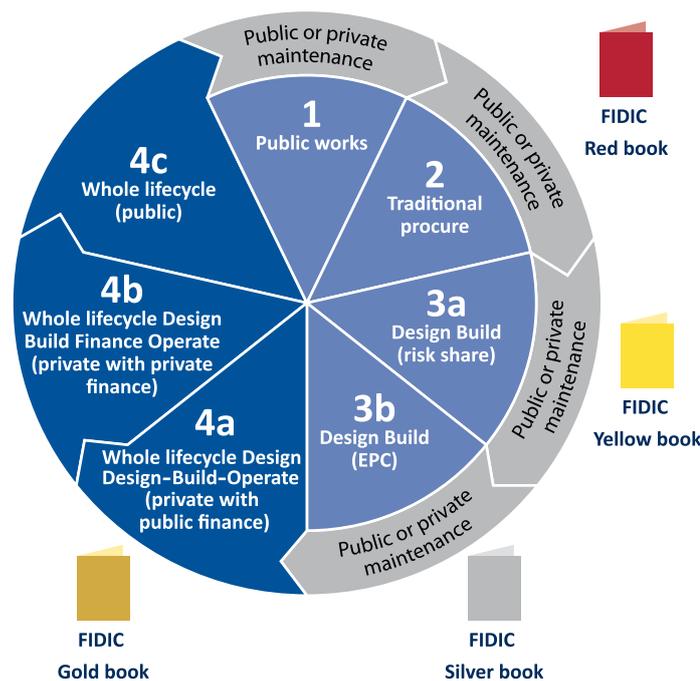
If Option (B) is chosen, the asset can be built for US\$ 150 million and the maintenance costs are US\$ 1 million a year, except in every fifth and tenth year when there are slightly higher maintenance costs. Taking the example of the road again, a more expensive construction solution may require fewer annual spot repairs and little resurfacing.

The cumulative total **whole lifecycle costs** show that the cost of building and maintaining the road for the first 12 years is cheaper with Option (A); Option (B) ends up costing less in total (lower total cost of ownership) only after year 12.

Faced with this decision, governments sometimes prefer Option (A) to Option (B) as the former requires less fiscal resources, or alternatively enables three cheaper roads to be built for the price of two more expensive roads. Further, the decision may be seen as a “*vote winner*” if the electorate, as taxpayers, are unaware the roads will ultimately cost more after the twelfth year.

Governments have four main choices for how to build a new asset (or refurbish an existing asset) and then maintain the asset summarized in Figure 19.

Figure 19: Options for Building and Managing Publicly-funded Infrastructure



Option 1 - Public Works Procurement Options

Governments sometimes have their own in-house public works department (Option 1), which designs and builds the asset using its own in-house team of engineers. The maintenance can be carried out in-house or tendered out to the private sector with an **outsourcing** or **maintenance contract**. Depending on governments’ priorities, the engineers will sometimes be required to design infrastructure that keeps construction costs down without needing to consider the costs of maintenance in 20 or 30 years.

Option 2 – Traditional Procurement Options

As construction techniques become more complex, governments have started procuring building work from the private sector as a way to reduce construction costs or market test their own public works department. With the traditional approach (Option 2), government designs the asset and tenders out the construction to a private company. Bidders tend to quote unit rates, for example, using a bill of quantities. The “*winning*” contractor is normally the one who offers to build to the specifications as cheaply as possible. The International Federation of Consulting Engineers (**FIDIC**) has prepared a suite of contracts that can be used for different types procurement contracts. There are also other organizations that have prepared template contracts; for example, there is the NEC3 suite of contracts.⁵⁰ For the purposes of this report only the FIDIC contracts are referred to. For example, the FIDIC Red Book, *Conditions of Contract for Construction: For Building and Engineering Works Designed by the Employer*, contract is suitable for traditional procurement approaches. Like Option 1, the maintenance of the asset can either be performed by the government or tendered out to the private sector.

Option 3 – Design and Build Options

A problem with traditional procurement is the limited scope for innovation as all contractors are required to tender to build to the same design. This design may be much more costly than other innovative design solutions as government design teams may not be aware of new technical advances or have access to the latest computerized design packages that enable infrastructure assets to be built with fewer materials. With design and build options, the government will provide output specifications (or outcome specifications) for what is expected from the infrastructure, and will let the private sector propose different building configurations. As an example, bidders may be asked to tender to build a road that can accommodate 50,000 vehicles a day and up to 10,000 vehicles in any one hour with limited congestion, subject to meeting legal health and safety requirements. Bidders may offer different design solutions, such as the gradients of the roads, lighting, barriers, signage and materials. Nevertheless, with design and build solutions the government still needs to approve the final design and functionality, and be reassured that the solution meets all health and safety requirements.

Another problem with traditional contracts involves disputes over the quality of the asset that is built; the construction company may ascribe defects to a poor design while the government may ascribe the poor construction to poor building techniques or defective materials.

By requiring bidders to design the assets, the cost of tendering for projects will be higher but the eventual solutions will normally represent better value for money. Comparisons of the cost of building infrastructure with traditional and design build procurement approaches are limited, but there are a number of other construction sectors where detailed empirical research has been performed. For example, Konchar and Sarvido analysed 351 residential, office and industrial building projects in the United States of America and found that design and build projects were 6% cheaper per square metre than traditional procurement. They also found the assets were designed and built in 67% of the time of traditional procurement and were of higher quality.⁵¹ Another study that compared design and build to traditional procurement solutions for United States of America navy accommodation blocks found that design build projects are designed and built nearly twice as quickly as traditionally procured accommodation units and are much less likely to overrun in terms of cost, although there was little difference in the total cost per bed space built.⁵²

There are two design build solutions, notably:

- Option 3a – Standard design build contracts where some risks may be shared. For example, where there are extensive renovations required or where tunnels need to be drilled it is not possible to accurately estimate construction costs until the works have started. In these cases, a design build solution with some risk sharing may prove best value for money. The FIDIC Yellow Book, *Conditions of Contract for Plant and Design-Build: For Electrical and Mechanical Plant, and For Building and Engineering Works, Designed by the Contractor*, can be used for such contracts.
- Option 3b – EPC contracts, which are commonly fixed-price contracts (lump sum) although other variants exist; for instance, cost-plus. Here bidders design and build the asset and take the risk that overall construction costs are higher than anticipated. The FIDIC Silver Book, *Conditions of Contract for EPC/ Turnkey Projects*, contract is suitable for this option.

The choice about which is better for the procuring body, a risk sharing or a fixed-price design and build contract, needs to be considered on a case by case basis. It is also true that an EPC contract will never include full risk transfer as there will always be some risks that are retained by the public sector; for example, the risk that the prime contractor goes bankrupt during the construction period. As with Options 1 and 2, the government can either undertake the maintenance in-house or can tender out the maintenance to a private contractor.

Option 4 – Whole Lifecycle Cost Options

At its core, CBA evaluates projects over their whole lifecycles. Just as CBA is used to determine which projects are best for society, so CBA, and in particular **whole lifecycle cost analysis**, allows the initial investment/future maintenance cost trade-off to become clearer. In a not dissimilar manner to Figure 42 and the calculations in Box 17 of Appendix 6, Box 7 provides an example of how governments are starting to evaluate project and procurement solutions.

Box 7: Whole lifecycle costs

Assuming the cost profiles in Figure 18, governments can evaluate building and maintenance options just as they would a whole project. Using the principles of **discounting** from Appendix 6, if the government's **discount** rate is 4% a year in real terms, the net present cost of Option 1 is US\$ 192 million and the net present cost of Option 2 is US\$ 166 million. On this basis, Option 2 remains the best solution as in net present cost terms it is the cheapest.

Were government to incorporate wider social and environmental costs and benefits into their **whole lifecycle cost analysis** the differential may become even greater as less maintenance should mean less traffic disruption and less pollution caused by cars idling in traffic works.

Unlike Option 1, where the public works design team are not commonly required to optimize the **whole lifecycle costs** of building and operating an asset, if the government can appropriately incentivize the public works department and give it sufficient autonomy, public works **whole lifecycle cost** solutions are possible (Option 4c) and will represent value for money if the public works department is:

- experienced in the latest design techniques
- given necessary resources to minimize the **total cost of ownership** even if the optimal solution is much more expensive upfront
- able to negotiate and purchase construction materials more effectively than other companies
- able to build the assets more efficiently than private competitors
- able to maintain the assets to the requisite output/outcome-based specifications more effectively than private companies.

If most of these criteria are not met, nor are most of the other criteria identified in Figure 12, the government may want to consider a privately provided **whole lifecycle cost** approach (Options 4a and 4b) to determine if a better value for money solution can be supplied commercially.

One of the main private-sector **whole lifecycle costing** approaches are PPPs. *The World Bank's Public-Private Partnerships: Reference Guide Version 1.0*, states that:

"There is no single, internationally accepted definition of 'Public-Private Partnership'. This Reference Guide takes a broad view of PPP, as:

A long-term contract between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility

*This definition encompasses PPPs that provide new assets and services, and those for existing assets and services. It can include PPPs in which the private party is paid entirely by service users, and those in which a government agency makes some or all of the payments. The definition encompasses contracts in many sectors and for many services, provided that there is a public interest in the provision of the service, and that significant risk and management responsibility have been transferred to a private party."*⁵³

PPP contracts are commonly thought of as contracts where contractors design, build, finance and operate an asset for a defined number of years - the typical **Build-Operate-Transfer (BOT)** or **concession** approach included in Option 4b. However, the World Bank's definition includes a wider range of PPP arrangements which are illustrated in Figure 20. This figure also indicates where finance for the project is likely to be raised. Appendix 11 provides further explanation about the specific terminology adopted, drawing on the World Bank's resources.

Therefore, as illustrated in Figure 21, using the spectrum of procurement routes in Figure 19, six of the seven options could include a PPP component. Even maintenance-only PPP contracts will still need some form of **whole lifecycle cost** optimization as it will still be necessary to decide the optimum time to maintain the asset to meet the required specifications. Decisions include whether it is better to have preventive maintenance, a few maintenance cycles or reactive maintenance. The only option that cannot have PPP components would be **whole lifecycle procurement** where the government gives its public works unit full powers to design, build and operate infrastructure and minimize the **total costs of ownership** (Option 4c).

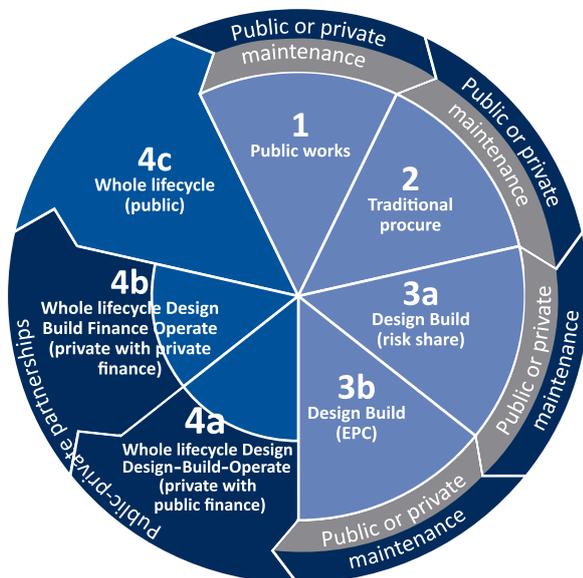
Figure 20: Types of Public-Private Partnership Agreement and Typical Sources of Finance

Public sector owns and operates assets		Public-Private Partnerships				Private sector owns and operates assets
<ul style="list-style-type: none"> – Utility restructuring – Corporatization – Decentralization 	<ul style="list-style-type: none"> – Civil works – Service contracts 	<ul style="list-style-type: none"> – Management and operating contracts 	<ul style="list-style-type: none"> – Leases/affermage 	<ul style="list-style-type: none"> – Concessions – BOT Projects – DBOs 	<ul style="list-style-type: none"> – Joint Venture – Partial divestiture of public assets 	<ul style="list-style-type: none"> – Full divestiture
Public finance				Mix of public and private finance		All private finance
<div style="display: flex; justify-content: space-between; align-items: center;"> Low Extent of Private Sector Participation High </div>						

Key : BOT – Build-Operate-Transfer DBO – Design-Build-Operate

Source: Based on World Bank's PPP in Infrastructure Resource Centre definition - <http://ppp.worldbank.org/public-private-partnership/agreements>

Figure 21: The Range of Public-Private Partnership Options



The FIDIC Gold Book, *Conditions of Contract for Design, Build and Operate Projects*, is suitable for DBO (Option 4a contracts), although it is acknowledged that there are many project specific issues which may require bespoke drafting. For this reason the Gold Book contract includes special provisions which give advice to contract drafters for issues to consider. At present there is no FIDIC contract for BOT contracts or concessions (Option 4b).

As PPP contracts will normally be tendered, bidders will want to put forward competitive pricing to increase the chances of being selected as preferred partner. Therefore, an inherent benefit of PPP projects is that they automatically encourage the bidder to price according to **whole lifecycle cost** approaches. Further, the greater the proportion of private finance involved, the greater the incentive for the private sector to deliver the requisite specifications on time, to budget and to fully adopt **whole lifecycle costing** approaches. External financiers will also perform extensive due diligence, serving as additional reassurance to governments that the project will be well-managed and monitored. However, the question is, can private finance be raised at an appropriate rate?

As it is generally more expensive for private parties to raise money than governments, and the finance is raised for one specific project, the annual cost of finance for a PPP project tends to be higher than the cost of government finance. However, evidence suggests the efficiency from applying innovative design solutions, fully considering **whole lifecycle costs** and having professional asset management outweighs the higher finance costs in most cases. For example, a UK National Audit Office survey in 2009 found that 65% of projects were built to cost, and “94% of projects responding to our 2008 survey were reported to have been delivered on, or less than 5% over, price”.⁵⁴ The case study for water provision in Romania provides another example.

Case Study: Concession Contract for Water in Bucharest, Romania

In 2000, the city of Bucharest entered into a concession contract with Apa Nova, a subsidiary of an international water operator, to operate its water utility.

The contract benefits from a well-defined concession agreement specifying service levels and allows the concessionaire to charge tariffs, allowing a reasonable return. The contract also incentivizes the concessionaire to find efficiency savings.

One of the biggest drivers for efficiency gains have been improvements in labour productivity with the number of staff per thousand connections falling from 75 in 2000 to 20 in 2007. Apa Nova was also able to transfer many of the risks for upgrading the system to a construction contractor.

A performance review of the concession contract by the advisers, Castalia, has found that, in the first 10 years, Apa Nova has improved water delivery services to Western European standards and been able to reduce water losses by about 44% between 2002 and 2006.

Tariffs are now below the average for other Romanian cities. Further, modelling by Castalia suggests that the concessionaire has saved US\$ 349 million over the first 10 years, compared to what it would have spent to achieve the same level of service under the municipal model. All this amounts to a 33% reduction in bills had tariffs been raised to meet the same level of service under the municipal model.

Sources: World Bank Group. *Viewpoint: Water in Bucharest: A Utility's Efficiency Gains Under a Concession*. January 2011. International Finance Corporation. *Success Stories: Romania: Bucharest Water and Sanitation (RGAB)*. April 2010.

The World Bank's definition means that an arrangement whereby the private sector and the government simply work together to deliver an initiative would not be classified as a PPP as such, but rather as **public-private collaboration** or **public-private cooperation**.

In summary, when assets need to be built, **whole lifecycle costing** approaches (Option 4) tend to provide best value for money to society and the taxpayer over the longer term, although there is a need to consider each case on its merits. For example, is there market appetite for PPPs; and does the project require extensive works which are difficult to price (such as underground works)?

Challenges and Solutions for the Different Procurement Routes

Two common challenges with all procurement routes are:

- **the perceived difficulty of the public sector to negotiate terms with private contractors.** A solution is improving the information available and improving the procurement skills of civil servants. For example, governments can create databases of construction costs, employ specialist advisers or send civil servants on relevant training courses. The United Kingdom government is sending civil servants on a new, year-long procurement course designed by the Saïd Business School at Oxford University⁵⁵
- **government accounting rules.** Many government accounting and budgeting frameworks do not automatically ensure that future repairs and maintenance costs are fully resourced when new infrastructure is procured. For example, in the United Kingdom budgeting for infrastructure investments broadly follows the European System of Accounts (**ESA 95**) which may not record a future liability, and hence a call against a capital budget, for repairs of uncertain cost or timing because these are contingent, and ESA 95 only records a transaction when fund flows between entities are committed. However, any money borrowed to pay for the infrastructure will be a long-term liability as there is a commitment to repay the borrowed monies.

Procurement routes such as service concessions or PPP arrangements will usually bundle resource provision for future repairs and maintenance costs. Under ESA 95, and other public sector accounting rules, such arrangements are not recorded on the government's balance sheet if they are shown to be long-term service contracts in which the contractor assumes most of the risk of ownership of the infrastructure. However, under International Financial Reporting Standards (**IFRS**) and International Public Sector Accounting Standards (**IPSAS**), such PPP arrangements may be recorded as a long-term liability on the government's balance sheet if the government determines how the assets are used for all of their useful economic lives. Hence more PPP transactions may become included in public sector long-term liability measures as IPSAS and IFRS implementation increases worldwide, which will mean that PPP solutions will increasingly be chosen solely for their efficiency and delivery benefits, rather than also for balance sheet issues.

The remainder of this sub-section summarizes some of the particular challenges and solutions for each of the different procurement options.

Where Assets Have Already Been Built (Brownfield)

Opportunities to reduce maintenance costs are limited when infrastructure assets have already been built. However, the skills needed to maintain assets include not only engineering competencies, but also management skills to set maintenance schedules and ensure that staffing rosters can deal with unforeseen issues. The main solutions are therefore to introduce output- or outcome-based specifications and to market test the maintenance arrangements against in-house services. If a privately provided solution is selected, the performance of the contractor can be monitored. and when the contract comes up again for tender the government can make an objective decision on which is the better maintenance route.

Where Assets Need to Be Built (Greenfield)

Assets that have not been built need to be financed, either from government tax receipts, government asset sales, bond launches or using PPP projects with private finance. Section B.3 provides further detail about efficiently managing the cost of finance.

Another issue is how to keep the design and bidding costs reasonable. As has been discussed, with traditional procurement only one design is prepared which does reduce total design costs, but the issue of whether the design is optimal or whether other solutions would have saved monies remains.

When asking for design build (Option 3) or **whole lifecycle costing** (Option 4) bids, potential contractors must undertake their own design work, which costs money that only the successful bidder will be able to recoup. For example, some companies state that, when bid costs are very high, they will bid only if they believe they have a 50% or greater chance of winning. To achieve the best value for money, the government must balance the competitive tension that arises from having a number of strong bidders against the possibility that consortia will not submit tenders if bid costs are very high, bid processes are very long, or if there is a lack of clarity on how final decisions are made.

To retain strong competitors, civil servants need to keep the tender requirements very specific and fully consider the costs of all bid requests they make. In so doing, they may design down-selection criteria (such as companies passing turnover thresholds and relevant experience thresholds) that quickly reduce the competition to three or four tenders so that fewer bidders incur costs. Likewise, processes should be put in place so the government can make decisions quickly and bidders can manage their work schedules. An alternative possibility for complex proposals is for the public sector to partially compensate short-listed companies for their bid costs, even if the compensation is modest.

To preserve sufficient competition governments also need to think carefully about the total cost of projects, the likely technical solutions and country specific issues. For example, with many types of procurements where the private sector tenders to build assets, they will be required to provide a performance bond for up to 10%-20% of the construction cost. In addition to this, the contractors will also be required to provide defects liability cover for 12 to 24 months after commissioning. In the current financial market it is difficult to secure construction performance bonds above US\$ 400 million, which imposes a cap on the total project size of about US\$2.0 **billion** to US\$ 3.0 **billion**. Nevertheless, even in mature PPP markets the availability of debt for projects above US\$ 2.5 **billion** is more likely to be a constraint. As another example, on PPP deals funders prefer to support projects that utilize proven technical solutions, rather than support new technical solutions.

B.2. Utilizing Technology in Government Funded Infrastructure

Key points

- Technology and new materials offer many opportunities to reduce the cost of infrastructure
- However, other important benefits can be achieved by promoting standardized building codes
- Also important are innovative design techniques to improve efficiency and minimize disruption

Technology is playing an increasingly integral role in delivering and managing infrastructure projects more efficiently and effectively. This section is intended to raise awareness about the possibilities of introducing new technologies and the benefits to be gained from innovative design solution, efficient project planning and developing standardized building codes.

Construction Materials and Machinery

Continued advancements in finding lighter, more durable and energy-efficient building materials have improved project performance and/or lowered costs. For instance, when self-healing cement is subjected to heavy loads, it deforms slightly, but when the load is removed the cement can recover its original shape. This significantly reduces long-term maintenance costs. Liquid granite (a cementitious material) can be used to make repairs within 10 minutes, dramatically reducing the amount of time maintenance can take.

Likewise, technological advancements in construction machinery have been able to shorten the construction period and improve construction quality and consistency. Once infrastructure is operational, other technologies are available to reduce operating costs, e.g. using cameras on the front of trains to assess the quality of railway tracks.

Case study: Singapore's Water Independence Day

Singapore is striving to meet a long-term goal: total water independence by 2060. Currently the city relies heavily on neighbouring Malaysia for 50% of its water, so there is plenty to be done. Their overall solution is to save water, clean wastewater, catch rainwater and desalinate seawater. Desalination is planned to account for 30% of the water supply by 2060. So far, Singapore has built one large desalination plant, providing 10% of local water needs.

The plant uses reverse osmosis through lightweight membranes that deliver more surface area than comparable types. This means the plant has a smaller footprint – something very important in densely populated Singapore. Another key feature is the plant's energy recovery system. Designed to minimize operating costs, the system uses a pelton wheel and pressure exchange energy recovery to deliver fresh water at 4.1kWh/m³. This makes the plant one of the most energy-efficient ever built and helps it produce the world's cheapest desalinated water. A second plant is due in 2013, putting Singapore well on the road to its water independence day.

Source: Siemens

Construction Design Methods

Better construction design methods can improve the efficiency and quality of construction. For instance, the prefabrication of components has helped to reduce on-site construction and assembly times and makes construction standards more consistent. It can also reduce the amount of waste created. The Ontario Infrastructure Plan provides another example where a replacement bridge was built next to an existing one, and then when it was completed the existing one was demolished and the new one pushed in place with hydraulic jacks. This approach was able to minimize traffic disruptions.⁵⁶

Computer aided design (CAD) is widely used for designing, construction management and collaboration. Computers can also be used to model the effects of explosions when excavating sites. For example, the underground metro network in Hong Kong has incorporated computer-aided blasting analysis into its excavation design and planning to lower disruption and improve safety in the densely populated conurbation.

Efficient Project Planning

Section B.4 gives an oversight of project management methodologies, but relatively simple efforts, such as coordinated construction practices, can yield significant improvements. For example, by coordinating gas, water and electricity maintenance works on a major arterial road in London the project was completed in half the time.⁵⁷ As another example, rather than having project management carried out by a number of teams at different stages of a project, cost savings can be secured if private sector and public sector organizations have project management teams dedicated to an entire procurement. As governments typically are big purchasers of infrastructure, as the United Kingdom's Egan Report recommends, governments should also commit themselves "to leading public sector bodies towards becoming best practice clients. We believe that this process must begin with substantial improvements in the way that the public sector procures construction".⁵⁸

Unified Building Standards and Coordinated Construction Practices

While building standards, building codes and construction practices do not necessarily fall under the strict definition of "technology", they can make construction much more efficient. Building codes help to standardize materials and make construction processes simpler, as well as address health and safety issues. The trend of developing pan-regional building codes (e.g. the Eurocode European Standards) allows the mass production of components and materials, further reducing the costs of building.

As an example of the benefits of simplifying and standardizing technical standards, London Underground aimed "to reduce the number of pages of their in-house standards from 12,400 to 400 by March 2012, greatly simplifying requirements and focusing on performance and outputs."⁵⁹

B.3. How Should Governments Maximize the Efficiency of Finance?

Key points

- Governments can either use their own cash reserves, raise taxes, issue government bonds or use privately financed PPP and BOT solutions where a private sector contractor builds, finances and operates infrastructure with the government then paying for the infrastructure over a number of years from the date it becomes operational
- Various options are provided for improving the efficiency/ reducing the financing cost of privately financed BOT and other PPP deals

Section A.5 discussed how projects will be **funded** – whether from user charges, taxpayer receipts or a combination of both; for example, user charges with government subsidies, or a toll road **concession** with an upfront government capital contribution to make the toll charges affordable to the general population.

The **finance** decision differs from the funding decision, with the choice of financing method depending on the sources of available finance, the relative benefits of those sources of finance and their costs (both explicit and implicit).

As with the rest of Part B, this section focuses on infrastructure funded or paid for at least in part by government, rather than infrastructure that is privately owned and wholly funded from user charges.

Government’s main finance considerations are likely to be:

- What public or private finance is available?
- What can be done to make the cost of finance more efficient?
- What might be done to widen the choice of finance sources?

What Public or Private Finance Is Available?

Many public and private sources of finance can be used individually or in combination to finance a project (Figure 22). Whatever the project, it is worth noting that:

- Public assets do not have to be financed by public finance, and private finance (as used in BOT and other PPP deals) may have a role, either in part or in whole
- While it is generally thought that governments have a lower cost of capital than private-sector sources, this assumption is not always true and should be tested for individual circumstances. For example, a large international mobile telephone company may be able to borrow money to expand a new mobile network in an emerging economy at a cheaper rate than the government, although this example is for user-funded infrastructure not taxpayer-funded infrastructure
- There may be a wider choice of funding routes available than initially thought
- While private assets are generally financed from private sources, the availability of government loans or grants may be useful to kick-start projects in new “*riskier*” areas, for example, renewable energy sources.

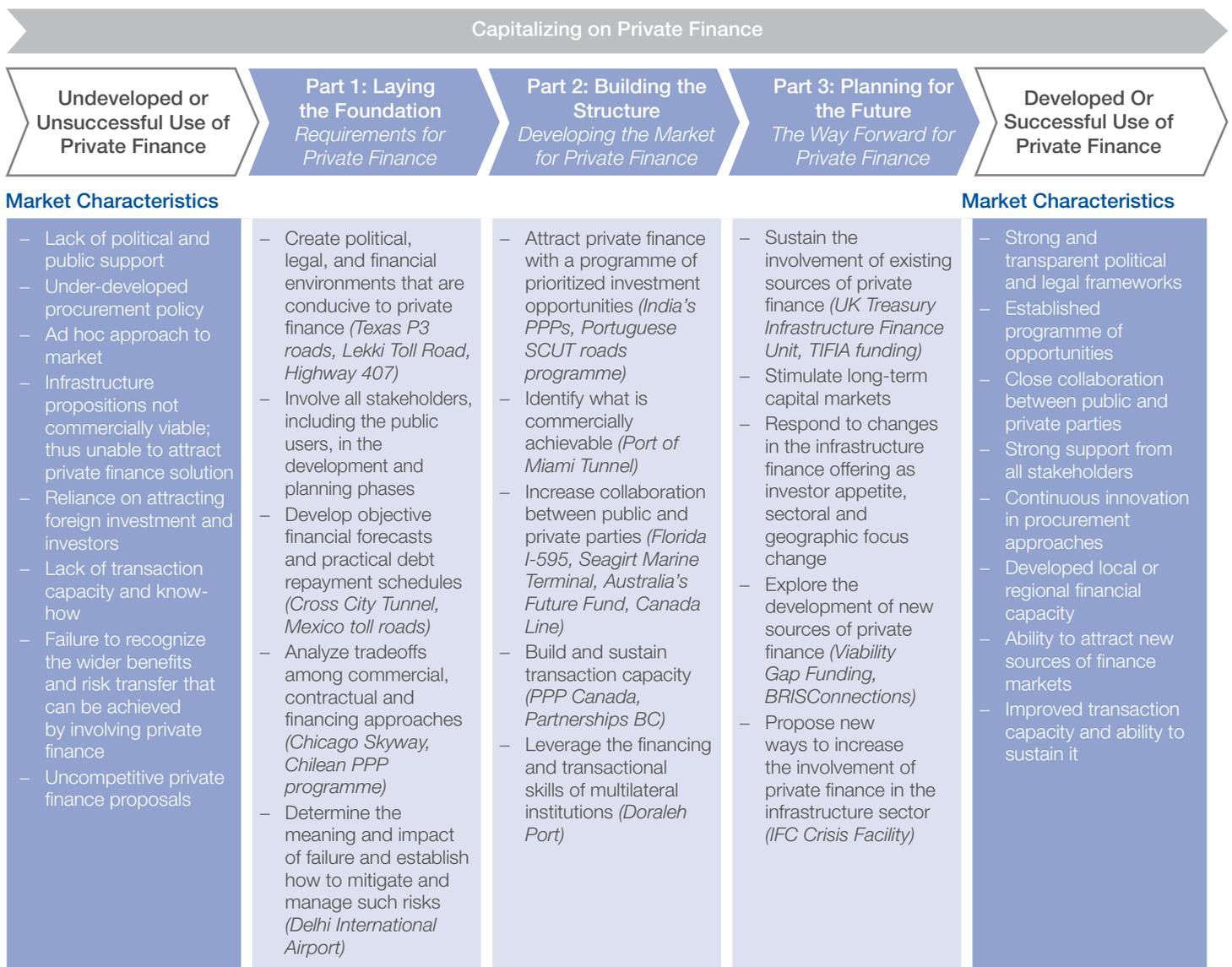
When considering private finance, Figure 23, drawn from the World Economic Forum’s report, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*, highlights the three stages required to achieve a vibrant private finance market for infrastructure, notably:

- **Laying the Foundation:** The requirements for Private Finance – i.e. how a country ranks on the 14 parameters of the **Strategic Infrastructure Planner Tool**
- **Building the Structure:** Developing the Market for Private Finance – i.e. having a sensible prioritized list of infrastructure projects with the private sector being confident it will be paid by government
- **Planning for the Future:** The Way Forward for Private Finance – i.e. sustaining growth in the market as it matures

Figure 22: Routes to Finance Infrastructure Investments

	Ways of financing the build	Examples	Who can own the asset?		Cost of the funds
			Public sector	Private sector	
Private Finance	Existing cash resources	Some large companies are able to fund investments from existing cash flows, e.g. mobile telecommunications firms often pay for the cost of installing transmitter masts from their cash flows	●	●	Private sector cost of capital
	Asset sales	Companies can sell parts of their firm, or can dispose of surplus assets to finance the construction of the new infrastructure	●	●	Private sector cost of capital
	Vendor financing	Large supply chain companies may be prepared to deliver the materials and also offer financing to cover the cost	●	●	Cost of vendor financing
	Corporate debt	Corporates can utilize the funds they borrow for their company’s general operations, with the debt backed by the company’s balance sheet	●	●	Cost of debt to the corporate
	Project finance	Many options – see Figure 52 in Appendix 12	●	●	Cost of project finance
Private Finance	Government bond issues	Government uses bond receipts to fund the building of the assets	●		Cost of issuing government debt
	Government asset sales	Government privatizes companies or sells land to finance new infrastructure	●		Government cost of capital
	Existing cash reserves	Some governments running a fiscal surplus may have spare cash reserves	●		Government cost of capital

Figure 23: Maximizing the Value of Private Finance in Infrastructure



Source: World Economic Forum, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*, p. xiii. The projects referred to are case studies that are contained in Part 4 of the report, pp.83-129.

As indicated, an important source of infrastructure funding is the **project finance** market, with its debt and equity financiers. The essence of **project finance** is that the investors (equity) and lenders (commercial debt) are looking for their monies to be spent only on the development/upgrade and maintenance of a single project (whether a single asset or group of contractually linked assets) and for their investment return or debt repayment to be wholly dependent on the performance and future revenue streams (cash flows) of that project. The case study of the Panama Canal provides an example.

Case Study: Revenue-backed Finance – the Panama Canal

In 2008 five MDBs (the European Investment Bank, the Japan Bank for International Cooperation, the Inter-American Development Bank, the International Finance Corporation and Corporación de Fomento) offered US\$ 2.3 billion to finance part of the US\$ 5.2 billion Panama Canal expansion. The remainder of the finance is being raised from toll receipts from the existing canal.

Why approach the MDBs?

The finance was raised at the time of the Lehman Brothers bank collapse; MDBs were selected as they were able to offer longer-term loans than commercial banks.

How will the MDB loans be repaid?

The loans are not secured against the new canal being built, but rely instead on being funded from future toll charges. Although the loans are for 30 years, the Panama Canal Authority hopes to repay the loans within 20 years, i.e. within 14 years of its opening, due in 2014.

Source: Jane's Transport Finance. *Panama Canal Lands Funding*. October, 2008.

If assets have an open market value, it may be possible to secure finance backed by the asset value. A residential mortgage is an example. Asset backed **project finance** is sometimes used on railway rolling stock deals as there is a secondary market for engines and carriages. However, rolling stock does not come within the strict definition of **economic infrastructure**. Asset-backed finance is also sometimes used for **industrial infrastructure**. However, as it is difficult, if not impossible, to move **economic infrastructure** (e.g. a bridge or a railway) from one location to another, asset-backed **economic infrastructure** finance is rare.

To achieve this single project focus, usually a legally independent project company will be created, often called a **special purpose vehicle (SPV)**. Further detail about the many different sources of **project finance** debt and equity is shown in Figure 52 in Appendix 12.

A characteristic of project finance is that the ratio of debt to equity is higher than for many corporate loans. A typical ratio is 80%-90% debt and 10%-20% equity, but the actual ratio achievable will be specific to each project. As the debt and equity have only one route for payment, in effect they have “*all their eggs in one basket*”, they will want to fully understand the project risks. In case of poor project performance, the equity investors will be the first to suffer any losses, before debt funders – which explains why the debt funders are often referred to as senior funders.

Opportunities to Make Finance More Efficient

In this section focus is given to making the cost of finance more efficient by reducing project specific risks.

Governments that procure infrastructure with traditional or EPC contracts will need to use existing resources, issue bonds, sell assets or could increase taxes if this can be done quickly. If government bonds need to be issued to achieve an efficient bond launch, the government should present credible fiscal plans to the markets that show that monies will be used for long-term growth-boosting capital investment rather than cover current spending requirements.

As mentioned in section B.1, the cost of finance for PPP projects tends to be higher than government’s cost of finance, for two main reasons:

- it is generally more expensive for private parties to raise money than it is for governments
- the finance is raised for a specific project so the security for repayment will depend purely on its cash flows, requiring a premium in both debt and equity returns unless risks are allocated very carefully.

As further explained in Section B.1, if private financing is brought in as part of a structure that incentivizes the right private-sector skills and provides motivation to assess risks and manage a project well (as in the BOT), the higher cost of capital can often be offset by reduced costs from delays, cost overruns and problems with performance, so the overall annual cost of PPP projects is often lower.

To maximize the efficiency of PPP project finance it is important to structure contracts appropriately so that risks are allocated to the public or private party best able to manage them (Appendix 7) and to create a supporting enabling environment by allowing unhindered capital flows.

Opportunities to Find Efficient Debt Solutions

The cost of debt can fall for three reasons:

- government-set interest rates or government bond **yields** (the effective annual return bond holders require) fall
- the general market costs of interbank borrowing or the general returns sought by corporate bond investors fall
- the specific margins bank and bond investors require for the project fall as the project is seen to be less risky.

Even small reductions in finance costs can make significant impacts on the overall cost of projects. Based on some purely illustrative costs, interest rates and various simplifying assumptions (see Figure 53 in Appendix 12), desktop analysis indicates that:

- a small reduction in the total cost of debt from 7% to 6.5% reduces the overall price the government needs to pay by more than 3% every year (Figure 54 in Appendix 12)

- government guarantees can also reduce the weighted average cost of debt. As an example, on a recent French court PPP project the French government guaranteed €550 million of debt and €49 million of the debt was provided on commercial terms. The liquidity margin on the guaranteed debt was reported to be 1.70% above the Euro Interbank Offered Rate while the margin on the commercial debt (comprising the liquidity margin and the credit margin) was 2.50% for the first 10 years and 3% for the last three years of the loan.⁶⁰ Using the same, non-project specific, illustrative assumptions as the example of reducing interest rates from 7% to 6.5%, Figure 54 in Appendix 12 provides an indication of the savings a government guarantee can generate, but in reality the actual savings to government will be less as some government-guaranteed loans occasionally experience payment problems.

Without seeking to explore all of the commercial, technical, economic and operational risks, two that the government has most direct control over are reviewed; namely governments taking some of the refinancing risk and government/MDB guarantees. These are explained in Box 8 and in Box 9.

Box 8: Government Takes Refinancing Risk

One idea is that if long-term debt is not available, the government can take some of the refinancing risks at the end of the debt term. As most national governments are the “*lender of last resort*”, it could be argued that governments are best placed to take the risk that (a) national interest rates rise, and the risk that (b) average bank margins may rise, while the project owners are best placed to take the risk that (c) assets are not built on time, to cost and to specification.

However, at the point of refinancing, the difficulty is how to determine exactly what proportion of any rising margins are due to “*market*” volatility and what proportion is project specific. One idea is that all PPP projects above a certain cost should be rated by one of the ratings agencies on signing the contract, and rated again shortly before the time of refinancing.



At the time of finalizing the contract, an agreement would be reached on what natural credit rating improvement should be expected for a project that is built and operating successfully and refinanced. For example, it may be agreed that a BBB rating would be expected.* If this rating is achieved at the point of refinancing, the government would assume all refinancing risk, but if the project does not achieve the BBB rating, the project company would have to take the loss of bank pricing between BBB debt and its lower rated project debt.

While this could be achieved in a mature financial market, where there are clear comparisons of debt of different rating quality, it will be more difficult in less mature emerging economies or those with smaller markets. The other challenge is being able to translate this theoretical approach into a robust contractual document.

* Further information about credit agency ratings is provided in Figure 56 in Appendix 12.

Box 9: Government and MDB Guarantees

In emerging economies, governments often guarantee minimum payments to PPP companies. This can generate two main benefits:

- Debt providers will take comfort from the guarantees and evidence that due diligence has been undertaken, and should be prepared to lend to the project at cheaper rates. This can make the difference between whether a project is viable or not or whether commercial banks are prepared to lend. Hence the guarantee has helped “crowd in” private capital. The following case study of the Asian Development Bank launching a US\$ 150 million Partial Credit Guarantee (PCG) facility to encourage small-scale investment in solar power projects provides an example
- it can reduce the weighted average cost of debt on the project.

The World Economic Forum/ International Chamber of Commerce G20 Working Group on Infrastructure Development has recommended that, “The G20 should encourage increased use of innovative MDB guarantees to increase market liquidity and help re-establish a thriving infrastructure investment market.”⁶¹

Another idea is to offer insurance products to protect investors against the risk that agreed government support will be withdrawn. For example, the Spanish renewable market was badly affected when the government retrospectively cut solar subsidies to try to claw back several billion euros.

Case Study: Asian Development Bank India Solar Power Guarantee Facility

India already has its ambitious National Solar Mission, which is targeted principally at large-scale solar projects. To encourage smaller grid-connected solar projects, in addition to the National Tariff Policy, the Asian Development Bank (ADB), supported by grants from the governments of Japan and the United Kingdom, is setting up a pilot partial credit guarantee (PCG) scheme. Under the scheme, energy companies that want to build small-scale solar parks (2-25MW capacity) can apply for preferential loans from two ADB-endorsed partner banks (NORD/LB and L&T Infrastructure Finance Company Ltd). A number of projects are now in the due diligence stage and are seeking to benefit from the PCG, representing more than 600 MW.

The table below illustrates how the scheme can make small-scale solar power projects commercially attractive, principally by enabling longer-term and cheaper loans.

	Without PCG	With PCG
Technical support	None	Some provided by ADB
Due diligence undertaken	By banks	Principally the ADB endorsed banks, with some by the ADB
Length of loans	Typical length of seven years, but some up to 12 years	<ul style="list-style-type: none"> – ADB endorsed banks – may be prepared to lend for longer than seven years – ADB itself – up to 15 years
Annual interest rates	High	Weighted average interest rate is lower as: <ul style="list-style-type: none"> – 50% is guaranteed by the AAA-rated ADB – ADB endorsed banks lending the other 50% will take comfort from the ADB support and should charge lower interest rates than they would without support
Are projects commercial?	No, only in areas not linked to grid	Proposals are currently being evaluated for readiness

Source: Asian Development Bank. *ADB's Solar Power Generation Guarantee Facility in India*. November, 2011

Limitations to Reduce the Cost of Debt

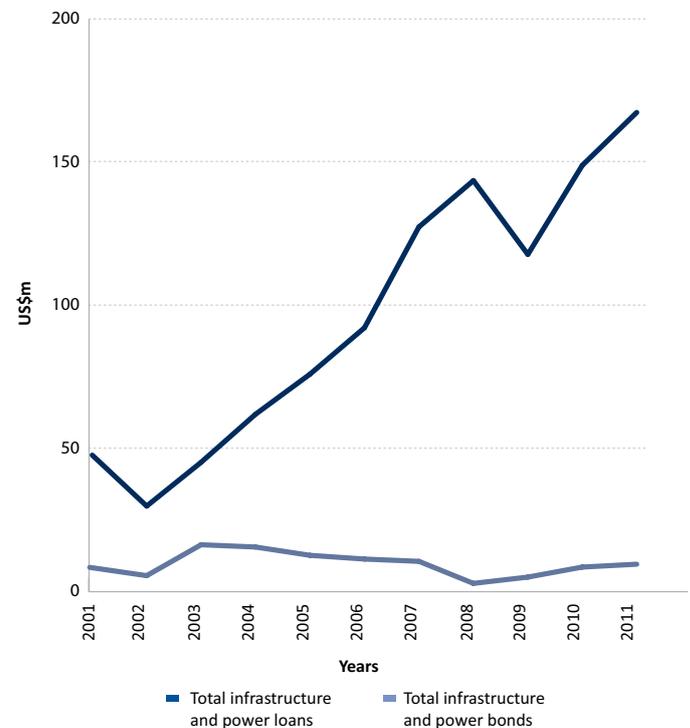
Two big limitations exist to reducing the scope of the cost of debt:

- the continuing effects of the global financial crisis and reduction in commercial bank lending
- the impact of regulation in particular on banks' capital adequacy ratios.

As more fully explained in the World Economic Forum's report, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*, the global credit crisis caused a marked contraction in the amount of debt available for lending and meant banks were more comfortable lending for shorter periods. This had an impact on infrastructure in particular; fewer banks wanted to lend for the longer investment cycles suitable for infrastructure (often about 15 years), and the funding for larger projects was insufficient.

As shown in Figure 24, this situation has eased but remains an issue and banks may require other changes to the finance structure, for example, a reduced debt to equity ratio, or changes to the commercial structure to reduce risk, or they could impose higher pricing. Evidence also exists of banks lending only to relationship clients.

Figure 24: Global Infrastructure and Power Loans and Bonds (2001-2011)



Source: Dealogic, accessed 4 May 2012

The impact of regulation is also relevant. The new Basel III bank standards and the EU Solvency II Directive require banks and insurance companies to hold higher reserves, meaning they are ever more reluctant to hold long-term debt. Basel III will be phased in from 2013 to 2019 and will require banks to increase the amount of “*common equity*” (ordinary shares and retained earnings) they hold from 2% to 4.5% as a minimum.⁶²

One option to try to access larger amounts of money is to reduce the length of PPP deals to more closely match the shorter term funding preferences of banks. However, as stated in a 2006 United Kingdom HM Treasury report, the duration of PPP contracts “*are based upon a variety of factors but should ultimately reflect the optimal period over which the procuring authority wishes its services to be provided, with reference to possible changes in service requirements... The long loan periods available from private financiers must not be a material factor in deciding an appropriate contract length.*”⁶³ While very long-term loans are not available in the current market, the alternative is true – the current lack of long-term loans should not be a material factor in deciding an appropriate contract length. Governments should therefore consider each PPP case on its merits, but may find that in some instances a 15-year contract can offer nearly all of the whole life incentive benefits as a 25-year contract while being more flexible to government’s needs and possibly easier to secure finance for.

Opportunities to Reduce the Cost of Equity

Generally two types of equity investor exist:

- **Primary investors** – who invest in **greenfield** projects from commencement
- **Secondary investors** – who buy existing **brownfield** infrastructure assets normally when they are operational and are perceived to have lower risks.

The returns **primary investors** require are higher since equity is taking the risk of assuming the role as a project coordinator or “*integrator*”, bringing together the construction and operating companies, undertaking the project management and taking the risk of not being successful in winning the contract. For example, **primary investors** are taking the risk that the construction contractor could go bankrupt, or the risk performance bonds or guarantees they have to protect themselves from a poorly performing subcontractor are not callable. In particular, research shows projects with traffic risk often have unrealistic traffic demand forecasts.

Evidence of equity returns provided by Weber and Alfen state that **greenfield** toll roads have equity returns of 12%-16%, and once operational, investors are prepared to accept returns in the 8%-12% range.⁶⁴ This means that the returns a **primary investor** can make when selling the assets to a **secondary investor** after one or two years of operation will be much higher than the 12%-16% that were modelled over the project life. Figure 55 in Appendix 12 provides an example of the level of returns primary investors can make when selling an toll road concession, assuming the **primary investor** requires a 15% return over the contract and **secondary investors** are content with an 8% return when the asset is built and has a track record of meeting its operating requirements.

As another example of the savings that maybe possible, Figure 54 in Appendix 12 also shows the implications if **primary investor** equity rates of return over the project life are reduced from 15% to 12.5%. The savings per year generate approximately the same 7% reduction in the rental price government needs to pay each year as a reduction in the overall interest rate from 7% to 6%.

Figure 25 identifies six possible ways to reduce the cost of equity.

Figure 25: Six Potential Ways to Reduce the Cost of Equity

Encourage specialist infrastructure investors

Currently, many privately financed PPP greenfield projects are structured so the EPC contractor is an equity investor as well as the construction contractor. The benefit is the EPC contractor is incentivized to ensure the construction quality is high, not only to reduce the chance of claims but also because high building standards should reduce maintenance costs and increase equity returns.

Were infrastructure to become a more recognized asset class, more specialist equity investors would enter the market which should reduce equity returns requirements.

Set investment returns in monetary gains rather than percentage amounts

Although this report has also classified toll roads and **concessions** into the user-pay section (Section A.5), in these cases the government can set the **concession** length as a defined period (e.g. 20 years) or a certain amount of toll receipts, whichever occurs first. This encourages investors to build and collect the stipulated revenues as quickly as possible to maximize their effective equity return.

A similar approach is to end the concession when certain defined financial commitments have been met. This was successfully adopted on the Dartford Bridge project on the busy M25 London ring motorway, where the concession was set at 20 years or when all financial commitments had been met, whichever was shorter. Due to the success of the project, the government determined this had been met after 13 years and 8 months.

Promote PPP regulation that allows government to receive some of the gains

For the same reason that secondary market investors are prepared to accept lower equity returns so banks are often prepared to lend with lower margins once projects are operational. If they are willing to reduce margins, as the projected project revenues should not have changed, then the banks should be prepared to lend a larger amount of money. This enables the equity investors to receive the difference between the loan amounts. Many countries already have “*refinancing gain*” legislation where a percentage of the gain made can be clawed back by government.

Regulate returns and make the gains to primary investors clearer

In PPP contracts the risks transferred to the equity investor may result in significant variations in returns. Another structure, more common in the utilities sector, is a regulated regime where the risks to the investor are arguably smaller, meaning the returns equity investors require are smaller.

Consider ways to decouple the returns primary investors can make

Thought is being given to finding ways to address the size of the returns primary investors can make if they can successfully sell their project in the secondary market.

Make the cost of bidding cheaper

The cost of bidding for projects can be very high, as indicated in Section B.1. If bidders lose two or three bids in succession they may need to increase the equity returns on their winning bids to compensate for the projects they did not win. Therefore, the lower the cost of bidding and the more efficiently and quickly the public sector can decide on the winning bidder, the lower the required equity returns should be.

Limitations to Reduce the Cost of Equity

The fundamental limit to reducing the cost of equity is that while investment in infrastructure may provide portfolio diversification for investors or a good match for their liabilities, they have many other investment opportunities. For example, as it is sometimes a challenge in emerging economies to secure a sufficient number of interested investors, there are few opportunities to reduce the cost of equity. Governments therefore need to be aware that if they exert too much downward pressure on returns investors will not bid for projects.

Finding New Sources of Finance

In some instances the markets will naturally develop new sources of finance, but governments and policy-makers can do a number of things to encourage innovation and bring some forms of finance back. Figure 26 provides ideas to expand the pool of potential funding sources.

Figure 26: Limitations to Reduce the Cost of Equity

Mezzanine finance or support

Hadrian's Wall Capital and its partner Aviva have reached the first close on their United Kingdom infrastructure debt fund, which is ultimately targeting a value of GBP£1 billion and will offer long-term debt for infrastructure projects. Their product:

- splits the senior debt into two components: (i) long-dated bonds with a rating of at least BBB+ (S&P and Fitch) or Baa1 (Moody's)*, and (ii) credit-enhancement bonds that are bought by the fund and are part of the senior debt structure providing first loss protection for the BBB+ bonds
- provides creditor services including origination, structuring, surveillance, reporting and daily decision-making.

It has been suggested that the uplifted rating on the bonds issued to the market could theoretically be achieved because fund investors take the first 10% or so of any loss. Bonds with a rating of BBB+ or more have historically been very attractive to investors and have been priced competitively. However, as the fund has no track record, the exact benefits cannot be quantified and are also dependent on differences between the pricing of bank debt and bond pricing.

The European Investment Bank (EIB) is also structuring a similar credit-enhanced product, the EU 2020 Project Bond, but instead of offering the market a complete debt solution, the European Investment Bank will provide “mezzanine debt” (investments that lie between equity and senior debt) and rely on the bond markets themselves to raise the remaining debt from investors, such as pension funds, which have a BBB+ or even A- ratings as their minimum investment criteria. The aim is to use EIB's financial strength to again offer infrastructure companies an overall cheaper debt solution.

* Further information about credit agency ratings is provided in Figure 56 in Appendix 12.

Different sources of long-term capital

Other sources of long-term funds are the sovereign wealth funds and pension funds that need to match their long-term deposits from investors and their pension liabilities. Representing less than 1% of pension funds' allocations worldwide, pension companies do not view infrastructure as a mainstream asset class, unlike real estate, gold, cash, shares, emerging markets investments and bonds, but rather as a specialist asset class for which they do not have the skills to evaluate investments, in particular new infrastructure projects. To overcome this, governments are considering a number of possibilities, including:

- changing the risk/reward profile of projects so they are more appealing to pension funds. For example, the UK government aspires for pension funds to invest more than GBP£ 20 billion of their assets into infrastructure projects and is currently working with them to find ways to make the asset class more attractive. The case study of the Chilean government's involvement in the Chilean pension fund market is another example.
- mandating that pension funds should invest a certain amount of their funds in infrastructure assets.
- supporting the creation of very large specialist infrastructure funds that can undertake the necessary due diligence. Pension companies can then invest directly into the specialist fund.

Case Study: Chilean Pension Fund Investment in Infrastructure

In Chile, pension funds are only allowed to invest in certain asset classes and are monitored by the Chilean Risk Rating Committee. So that infrastructure projects could be classed as acceptable investments, many infrastructure projects/road concessions raised debt through infrastructure bonds that were either:

- guaranteed (also known as “wrapped”) by the AAA rated monoline insurance companies
- supported by government issued insurance contracts to the concessionaires, for example guaranteeing minimum revenue flows for road concessions so the bond receives a credit rating similar to that of the government (currently A+).⁶⁵

The government has been successful with this approach such that, in November 2010, 10.2% of investment by Chilean pension funds is in the infrastructure sector.

Source: BBVA. *Economic Watch Pensions: Infrastructure Investment and Pension Funds in Chile*, May 2011

B.4. Project Management for Government Funded Infrastructure

Key points

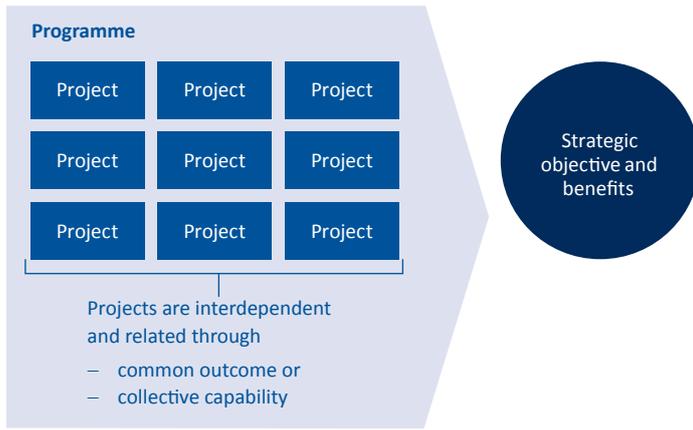
- With infrastructure projects often costing more than US\$ 500 million, poor project management can result in large cost overruns and delays
- To reduce the risk of this, governments should adopt a recognized project management standard

Once the government has decided which projects it wants to accelerate and the appropriate procurement route for each, strong project management is needed to deliver the project on time and to cost.

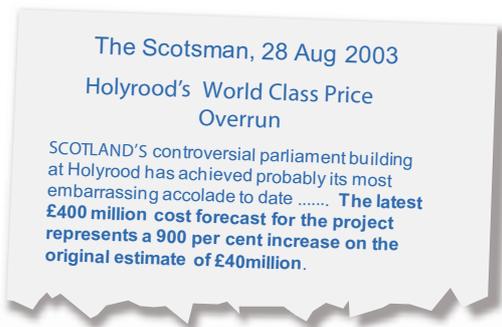
The Project Management Institute (PMI) defines a project as, “temporary in that it has a defined beginning and end in time, and therefore defined scope and resources. Project management, then, is the application of knowledge, skills and techniques to execute projects effectively and efficiently. It's a strategic competency for organizations, enabling them to tie project results to business goals – and thus, better compete in their markets.”⁶⁶ A project can therefore be building an infrastructure asset, although one could also envisage the development and enactment of a PPP Law as a project.

When a government department or a central delivery unit is responsible for a number of projects which have common outcomes, consideration should be given to managing groups of projects as programmes. A programme-managed approach enables the efficient management of dependencies between projects and the risks common to several projects. The PMI defines a programme as “a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually.”⁶⁷ As illustrated in Figure 27, programme management is therefore the process of managing and supporting project-level activities to achieve the strategic objectives and benefits of the overall programme.

Figure 27: Programme Management



A disciplined approach of initiating, planning, executing, monitoring and controlling, and closing is required to successfully deliver projects. The main goal of a relatively simple construction project is to physically deliver the promised scope on time and on budget. Given the large scale and complexity of infrastructure projects, achieving this goal within limited resources has been a challenge. In the private sector companies routinely select a well-known professional project management methodology, and train their project managers to successfully apply the skills, tools and techniques to meet the requirements of given projects.



Project Management Institutions

Several international institutions aim to set standards and promote the profession of project management with research, reports and training programmes. Such institutions include the PMI, the International Project Management Association (IPMA), and Projects IN Controlled Environments (PRINCE2) (see further information in Box 10 below) and others.

Box 10 : Project Management Institute (PMI)

The Institute is a professional organization aimed at advancing project management. It offers a range of services, such as the development of standards, reports, research, networking opportunities, conferences and recognized professional qualifications.

PMI's Project Management Framework is based around the project lifecycle and is represented by five major project management Process Groups (initiating, planning, executing, monitoring and controlling, and closing).

Within the five Process Groups, nine project management Knowledge Areas are identified:

1. project integration management
2. project scope management
3. project time management
4. project cost management
5. project quality management
6. project human resource management
7. project communications management
8. project risk management
9. project procurement management

One of PMI's certification programmes, Project Management Professional, is based on the Project Management Body of Knowledge (PMBOK Guide).

Further information is available at: <http://www.pmi.org/PMBOK-Guide-and-Standards.aspx>

International Project Management Association (IPMA)

IPMA is a non-profit, Swiss-registered organization for the promotion of project management internationally.

IPMA's focus is in the development and promotion of the project management profession. It provides standards and establishes guidelines for the work of project management professionals through the IPMA Competence Baseline. A Certification Programme is delivered by National Member Associations and/or Certification Bodies in various membership countries.

As of 2010 there are more than 130,000 IPMA-certified competency certificates worldwide, which are held by recognized businesses and organizations around the world.

Further information is available at: <http://ipma.ch/>

Projects IN Controlled Environments (PRINCE2)

PRINCE2 is a process-based project management method that is used by the United Kingdom government and others. The strength of PRINCE2 is the clarity and control of the project management process. It provides clearly defined, manageable stages, where each stage has key inputs and outputs, specific goals and activities to be carried out.

PRINCE2 is based on seven principles (continued business justification, learning from experience, defined roles and responsibilities, managing by stages, managing by exception, focusing on products, and tailoring to suit the project environment), seven themes (business case, organization, quality, plans, risk, change, and progress) and seven processes (starting up a project, initiating a project, directing a project, controlling a stage, managing stage boundaries, managing product delivery, and closing a project).

PRINCE2 is also a certification programme and training is offered.

Further information is available at: <http://www.prinice-officialsite.com>

Frameworks and Methodologies

It is recommended that governments choose a standardized methodology and adopt this standard throughout for projects above particular sizes. The methodology should be scalable to provide an appropriate level of control for each project and be able to be applied in a range of scenarios. Importantly, however, regardless of the methodology employed, successful project management should go far beyond the mechanical checking of lists and project managers should constantly make sure the essentials of project management are being delivered. Based on the article by Prieto, *Ten Common Problems on Poor Performing Programs*,⁶⁸ Figure 28 explains some of the fundamentals of project management and provides indications of how they apply particularly to the public sector.

Figure 28: Ten Fundamentals of Good Project Management

A proper baseline

Rather than trying to produce the 'right' answer, a baseline should be formed based on realistic assessments. The following should be considered:

- realistic timelines, with well-defined scope and budgets
- sufficiently identified known unknowns
- well-thought out risk management and risk mitigation plans

Well-founded plans with clarity of objectives

Large, complex programmes require a well-thought out methodology to build the programme structure, which will consist of a programme execution strategy and plan, a supporting organizational framework, and processes and procedures that tie the programme together. In a well-developed plan, the following elements are included:

- detailed programme and project execution plans that are shared within the team
- clear project objectives that are defined or communicated
- thorough checks of assumptions and whether assumptions are prone to optimism-bias
- full buy-in and alignment from the team

Changes in political administration can generate significant uncertainty for private companies, which is why newly elected political parties should try to avoid stopping sensible well-planned procurements that are already in procurement.

Project-execution plans

The project-execution plan should match the project's objectives, strategy and constraints. Roles and responsibilities must match the requirements implicit in the project-execution plan. The following factors should be considered:

- the execution strategy should be built on defined strategic business objectives and on the project scope
- the execution plan should align with risk management and risk-mitigation strategies
- the execution plan should adequately recognize the links and **interdependencies** to other projects

Well-defined team and requisite skills

The best strategy, plans and tools are only as good as the individuals assigned the responsibility to utilize them. Governments often fail to realize the size of teams needed to effectively deliver projects, with teams often consisting of individuals who have never managed an infrastructure project or large procurement before.

Skills must match requirements as well as likely challenges the project will face. Clear responsibilities must be assigned and an assessment conducted of existing team and individual skill gaps. Well-defined teams with right skill sets generally satisfy the following:

- sufficient project management training and education
- team members who are fully aware of their roles and responsibilities, reducing the possibility of team members being frustrated by a lack of clarity
- sufficiently discussed roles and responsibilities early in the project
- **RACI (Responsible, Accountable, Consulted, Informed)** charts can be developed to provide this role clarity and can be used to identify the requisite skills so that specifically tailored training programmes can be provided.

Career progression in many civil services encourages changing post every two or three years. For large US\$ 500 million+ procurements, it can quite easily take three or four years to undertake feasibility studies, obtain funding approvals, secure planning permissions, issue procurement documents, evaluate tenders and negotiate with the preferred bidder. This means that many civil servants only ever see part of the procurement process, which can reduce incentives to drive value for money every step of the way.

Teams with flexibility

The concept and reality of one team must be continuously reinforced and sustained throughout the life of the project. When teams come off the track, three common root causes typically become evident:

- silos exist and value destroying behaviours have emerged
- common values are not continuously communicated and demonstrated
- information is not shared

The tools and frameworks of project managers are prescriptive, but this should not mean that all steps have to be rigorously adopted. Rather, the tools and frameworks are just that: indications of how to resolve problems. Often all the steps are not needed, rather ingenuity is needed to address problems. Some organizations complain that the project managers try to replicate the steps they have used on previous projects, rather than really understanding what their role is and seeing the *'bigger picture'*.

Creating a culture of responsibility, authority, accountability and organizational change management

The 'soft' issues really do matter and, by any measure, the *'soft'* issues are probably the most important for project management. Projects can suffer greatly from the lack of a culture of responsibility, matched by the lack of authority and accountability. To prevent such problems, the following can be considered:

- established formal ways of evaluating work and gaining feedback from team members (360° review)
- clearly defined and well communicated roles and responsibilities
- the right tools for evaluation, such as RACI charts and Key **Performance Indicators (KPIs)**
- consistent and frequent assessment of the project quality, progress and achievement

Execution power

Along with many other factors affecting the execution of the project, the following elements should be carefully reviewed for successful project delivery:

- an efficient decision process, with decision dates established, recognized and respected
- well-established priorities that avoid *'kangaroo'* management
- well-defined work process durations, reviews and approvals
- adequate team alignment and team training
- an understanding of project constraints

Civil service culture can also discourage urgency as there are rules and procedures to follow. One particular problem with the structure of governments is the project team may not be given enough authority to make decisions and may have to seek approval from managers, the finance department, ministers and other departments. This can generate paralysis, where projects are needlessly delayed due to the four or five levels of approval needed.

Project management works better if the team is given clear delegated powers, especially with cross-ministerial matters. Otherwise, time and resources can be wasted with *'petty politics'*.

Communication plan

Although one of the most important factors in project management, communication can be a great challenge especially with infrastructure projects, which can create many divergent views. Thought needs to be given to how messages are conveyed to the public, how stakeholders are engaged, how negative press coverage is dealt with, how communication is undertaken within and between teams and how teams and bidders engage. Across the project management team there needs to be:

- an understanding of when and how communication will be delivered
- continuous communication between organizational levels
- ways of updating progress, for example programme dashboards
- emphasis of critical activities and deadlines
- systems and change-order procedures to avoid informal decisions
- a process to communicate approved changes to the team in a timely and comprehensive manner

As well as verbal communication, written communication needs to be made as clear as possible. On large US\$ 500 million+ PPP projects, there can often be more than 200 contractual documents that need to be signed. The simpler the clarity of legal language in procurement documents and in legal contracts, the easier it is for all parties to understand what is required.

Strategic audits

Audits can provide great value to project teams by bringing the fresh review and insight projects require. In large infrastructure projects, these audits must go well beyond the fiduciary, quality and safety audits by looking at issues related to governance and strategy. Projects with good audit frameworks are often characterized by:

- project progress tracked or monitored from outside execution teams
- audit processes that drive project progress and quality improvement
- audits conducted on a regular basis throughout the entire programme
- audits that assess the project skill requirements, the actual resourcing plans and the actual skill levels in the team

Lessons learned and best practices

Project teams must be learning organizations. Knowledge capture, sharing and management contribute to sustained superior performance. At the end of each major phase, lessons learned need to be captured and communicated. The lessons learned should also be reviewed to ensure they represent best practice.

Source: Based on Prieto, B. *Ten Common Problems on Poor Performing Programs*. Project Management World Today, August 2011.

Different Examples of Good Project Management

Just as there is no one-size-fits-all for preparing a national infrastructure plan, so there is no one-size-fits-all for project management. However, the following case studies illustrate ways of conducting or facilitating project management. For example, asset management tools such as Ontario's Municipal DataWorks can be used as an input into an infrastructure maintenance planning process as such tools aid the prioritization, sequencing and scheduling of maintenance activities.⁶⁹ Appendix 13 provides guidance on securing an appropriate staffing mix and Appendix 7 guidance on good risk management and mitigation practices.

Case Study: Delegated Powers – Olympic Development Authority, London

In 2005 London was awarded the 2012 Olympic Games, which is built on a largely derelict and contaminated site in East London. Because of the size of the project, the contaminated land, the need to create an Olympic legacy and the time-critical nature of the project, the United Kingdom government decided to delegate delivery powers to the Olympic Development Authority (ODA, an executive non-departmental public body accountable to the Department for Culture, Media and Sport). The ODA was set up by statute with the purpose of doing “anything necessary for the purpose of preparing for the London 2012 Games...”⁷⁰

Given the challenge, the government was not able to form a fully operational delivery unit with only public-sector employees using public-sector employment practices. Therefore, the ODA decided to tender out some delivery components to a private-sector consortium. The winning consortium brought with it experience of managing previous Olympic construction programmes and is responsible for overall programme management and the project management of large construction works.

The delivery has generally been seen as a success, with the site being built ahead of schedule.⁷¹ Success factors have included:

- planning to complete the bulk of the construction works early to avoid scope creep and the risk of industrial disputes
- using standardized procurement documentation and maintaining transparency over the consortium's costs
- giving the consortia considerable autonomy while the ODA retains sufficient assurance and oversight of the overall programme. The two teams work with each other constantly and worked in the same offices for a period of time
- employing action-orientated teams with project management and procurement management expertise
- fostering a proactive communications strategy to mitigate the risk of concerns from residents who live near and around the Olympic site.

Source: Institute of Civil Engineering Proceedings. *Delivering London 2012: Organization and Programme*. Institute of Civil Engineering, Volume, 164. May 2011, pp. 5-12.

Case Study: Setting up a Body with Project Management Roles to Support Governments

South Korea's Public-Private Infrastructure Management Centre was first established under its PPP law. Its role includes pre-feasibility studies of public infrastructure, supporting the PPP legal framework, and supporting the evaluation and negotiation for PPP projects.

The Centre has been successful in ensuring projects are aligned with the government's National Infrastructure Plan, and has helped to accelerate private-sector investment in PPP deals.

Source: World Bank Institute. *PPPs in Infrastructure. Day 3: Session 13.3. Korean PPP Experience*. September, 2008.

B.5. How Should Governments Address Challenges Once Construction and Maintenance Starts?

Key points

- Regular maintenance and good project management can resolve or mitigate the effects of the vast majority of problems that can arise on infrastructure projects
- A number of solutions are suggested for dealing with some of the most common issues that arise

Once a project is approved and contracts are signed, many construction and operational challenges can occur. One of the main problems, that of maintenance schedules being missed, can be resolved by ensuring sufficient government funds are set aside for routine maintenance and that maintenance quality is monitored. The vast majority of the other construction and operational problems can be resolved with proper project management, contract structuring, contingency planning and by being flexible to changing or adapting the use of assets should circumstances change.

A further benefit of PPP models are that the PPP funders will closely monitor performance and bring any problems to the project company's attention before they become insurmountable – implicitly performing a role that governments would otherwise need to. Further, as PPPs are a partnership either party will be able to raise any issues during their regular partnership meetings to resolve them as soon as possible.

Figure 29 identifies some of the issues that can arise when the private sector undertakes the building works and/or the maintenance works, and some solutions to the problems. Most of these points also apply when the government is using a public works department to provide infrastructure services if the arrangement is properly specified in a formal agreement.

Investors may walk after Spain's solar cut

Institutional investors could be poised to retreat en masse from Spanish assets in the wake of a controversial ruling by Madrid.

Shortly before Christmas the Spanish government announced plans to retroactively cut pre-agreed “trade-in tariffs” for the country's solar-photovoltaic energy producers by 30 per cent, or €3bn (\$3.9bn), over the next three years.

The row could now have implications across Spanish financial markets. According to a survey of 52 institutions with €8,000bn of assets under management conducted in September by Opinion Research Business almost three-quarters described a retroactive change as a breach of investor confidence, and nearly half said they would reduce exposure to Spanish assets.

Financial Times, 9 January 2011

Some of the most relevant issues in Figure 29 are:

- requiring contractors to secure performance and construction bonds for part of the cost of construction works provides some insurance to the government if services are not provided as expected
- governments should abide by contracts once they have signed them, or at least compensate investors for changes, as investors view retrospective government actions negatively.

Examples where it may be sensible to renegotiate or terminate a contract includes cases where, while building the asset, it transpires that the asset is no longer needed. If the contractors have not ordered all the materials they need, the government may be able to agree a mutually acceptable deal where the contractor stops building and is partially compensated for lost profits.

- governments should look to optimize asset use when they are locked into projects. An example is whether congestion in other parts of a city may be reduced by encouraging through traffic on to a PPP road. Or perhaps the assets can be put to other uses.
- even if the construction or operations of infrastructure fall under the responsibility of a private contractor, governments should still properly monitor contracts, especially in deals that are worth tens of millions of dollars. For example, a 2008 report by Ipsos MORI for HM Treasury found that 66% of United Kingdom government-sector contract managers spent less than half their time monitoring projects, almost a third of managers had no training in contract management and 42% had not levied any performance deductions in the past year.⁷²

Chapter 3.7 of the World Bank’s *Public-Private Partnerships: Reference Guide Version 1.0* provides further information and solutions for other issues that may arise once contracts are signed and work starts. While this Reference Guide is focused on PPPs, many of the issues are equally applicable for other procurement structures.

Figure 29: Solutions for Certain Problems that Can Arise Over the Lifetime of Projects

Problems that can arise over the lifetime of the whole concession				
Government default	Foreign ownership and offshore tax	Force majeure – national disasters	Lack of flexibility to change	Unforeseen circumstances
– Insurance and government escrow accounts	– Approval processes if national security issues – Force project companies to be domiciled in country	– Government to cover risks that cannot be insured	– Try to ensure designs are flexible – Market test ancillary contract services every few years – Renegotiate	– Contingency planning
Problems during construction		Problems during operation		
Builder default	Need to change design specifications	End of concession	Operations contractor default	Poor service provision
– Performance and construction bonds	– Try to avoid, or work in partnership with contractor	– Proper planning and transition arrangements	– Performance bonds	– Public sector monitor performance standards

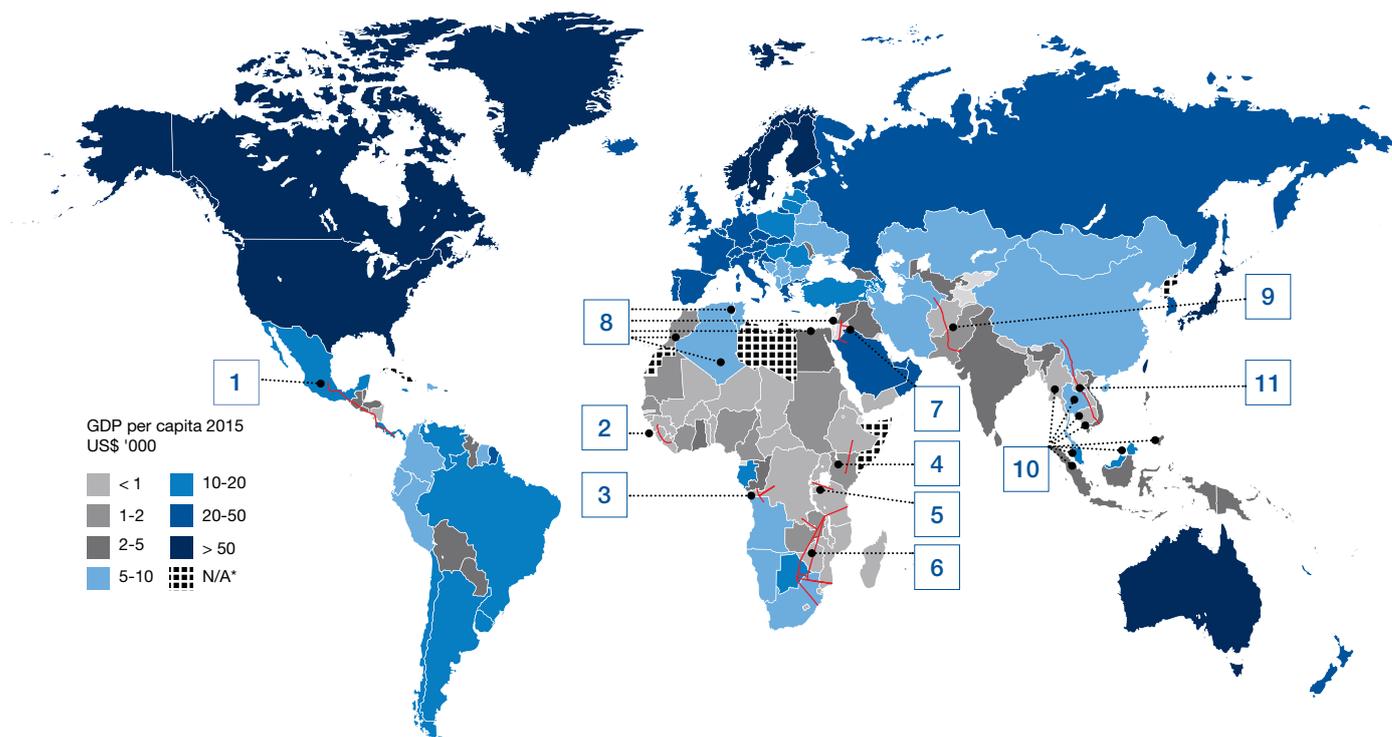
Appendices



Appendix 1

G20 High-Level Panel on Infrastructure: Exemplary Infrastructure Investments

Figure 30: G20 High-Level Panel on Infrastructure: Exemplary Infrastructure Investments



Latin America & Africa	Cost-US\$ bn
1. Pacific Corridor	3.8
2. Côte d'Ivoire-Liberia-Sierra Leone-Guinea Interconnector	Phase 1 =0.5
3. 40GW Inga Hydroelectric Dam & Transmission	Dam=80 Wires=10
4. Ethiopia-Kenya 2GW Electrical Interconnector	0.9
5. Isaka-Kigali Railway	1.6
6. North South Corridor Improvements	8.0

MENA & Asia	Cost-US\$ bn
7. Jordan Railway Project	3.8
8. Scaling up Solar Energy in MENA	4.0
9. Turkmenistan-Afghanistan-Pakistan and India Natural Gas Pipeline	7.6
10. ASEAN Infrastructure Fund	4.0
11. Regional Programme for Scaling-up Clean Biomass Energy in the Greater Mekong Sub-region	0.4

Source: G20 High-Level. Panel. *High-Level Panel on Infrastructure Recommendations to G20 – Final Report*. October, 2011

* The IMF does not provide 2015 projections for Cuba, Libya, Somalia, North Korea and Western Sahara

Appendix 2

Economic Infrastructure Investment Requirements, Actual Investment and Current Fiscal Challenges



Infrastructure investment, both to maintain existing infrastructure and build new infrastructure, remains a challenge in most developed and emerging economies. For example, in emerging economies about 1.4 billion people have no access to electricity and about 880 million people live without safe drinking water. Around 900 million rural dwellers worldwide have no access to an all-weather road within two kilometres of their accommodation.⁷³

Worldwide Infrastructure Investment Requirements

There is comparatively little data collected about infrastructure investment requirements throughout the world. However, the OECD has recently released a report, *Strategic Transport Infrastructure Needs to 2012*, which in part supersedes and in part augments the 2006 OECD publication, *Infrastructure to 2030: Telecom, Land Transport, Water and Electricity*. Figure 31 and Figure 32 in Box 11 summarize the annual investment needs included in each report and Figure 33 provides the author’s global estimate per year drawing on these numbers.

Box 11: Estimations of the Global Infrastructure Need

Figure 31: OECD Estimated Average Annual World Infrastructure Expenditure for Selected Sectors (2000-30) % of GDP (2005 prices)¹

	2000-10	2010-20	2020-30
Road	0.38%	0.32%	0.29%
Rail	0.09%	0.07%	0.06%
Telecoms ²	1.14%	0.85%	0.17%
Electricity ³	0.22%	0.24%	0.24%
Water ^{2,4}	1.01%	1.01%	1.03%
TOTAL	2.84%	2.49%	1.79%

- 1 April 2012 IMF World Economic Outlook figure for global GDP Purchasing Power Parity 2005 is US\$ 56,800 billion. Rather than use market exchange rates, Purchasing Power Parity attempts to compare an identical basket of goods in different countries to determine effective exchange rates
- 2 Estimates apply to the years 2005, 2015 and 2025
- 3 Transmission and distribution only. Adding in electricity generation would add around US\$12 trillion over the 30 years and adding in other energy-related infrastructure investments around US\$6 trillion over the 30 years
- 4 Only OECD countries, Russia, China, India and Brazil are considered here

Source: OECD. *Infrastructure to 2030: Telecom, Land Transport, Water and Electricity*. 2006. OECD Publishing. Table 1.1 on page 29.

Figure 32: OECD Estimated Average Annual World Infrastructure Expenditure for Selected Sectors (2009-30) US\$ billion (2008 prices) and % GDP Using 2008 IMF Purchasing Power Parity of US\$ 70,000 Billion

	2009-15	2015-30	2009-15	2015-30
Airports	70	120	0.10%	0.17%
Ports	33	40	0.05%	0.06%
Rail	130	270	0.19%	0.39%
Oil and gas – transport and distribution	155	155	0.22%	0.22%
TOTAL	388	585	0.55%	0.84%

Source: OECD. *Strategic Transport Infrastructure Needs to 2030*. OECD Publishing, 2012. Table 2.1 on page 56

Figure 33: Estimated Average Annual World Economic Infrastructure Expenditure (2010-30) % of Global GDP

	2010-20	2020-30	Source
Road	0.32%	0.29%	a
Rail	0.24%	0.39%	b
Airports	0.14%	0.17%	b
Ports	0.06%	0.06%	b
Telecoms	0.85%	0.17%	a
Electricity transmission and distribution	0.24%	0.24%	a
Electricity generation	0.70%	0.70%	a 1
Other energy	0.35%	0.35%	a 2
Water	1.26%	1.29%	a 3
TOTAL	4.16%	3.66%	

- a. OECD. *Infrastructure to 2030: Telecom, Land Transport, Water and Electricity*. 2006.
- b. OECD. *Strategic Transport Infrastructure Needs to 2030*. 2012. 2010-20 figures are estimated as the average of five years of 2009-15 expenditures and five years of 2015-30 expenditures
- 1. From 2000-30 electricity global generation expenditure is estimated at US\$12 trillion (2005 prices). This is equivalent to US\$ 400 billion per year or 0.70% GDP per year (2005 prices).
- 2. From 2000-30 other energy-related generation is estimated at US\$ 6 trillion (2005 prices). This is equivalent to US\$ 200 billion per year or 0.35% GDP per year (2005 prices). It is assumed that the OECD 2012 estimates for oil and gas – transport and distribution of 0.22% GDP are subsumed within this number.
- 3. The OECD’s water estimates covered the OECD countries, Russia, China, India and Brazil. In 2005 these countries represented 80% of world GDP in purchasing power parity terms (source IMF World Economic Outlook). Being conservative, and assuming water investment requirements for emerging economies is the same percentage amount as the developed countries then the global water investment requirements are (1.01% / 80%) 1.26% of GDP for 2010-20 and (1.03% / 80%) 1.29% of GDP for 2020-30.

Based on this analysis the average infrastructure investment needs for 2010-30 is about 3.9% of GDP per year. In 2011 the IMF World Economic Outlook estimates global GDP (in purchasing power parity terms) to be US\$ 78,900 billion. Therefore, adopting conservative assumptions infrastructure investment need in 2011 prices is approximately US\$ 3,100 billion.

These calculations give an average annual investment for 2010-2030 of about 3.9% (US\$ 3,100 billion in 2011 prices). As well as the OECD reports, the Cannes G20 MDB Working Group on Infrastructure estimated that infrastructure needs in emerging economies are roughly US\$ 1.1 trillion.⁷⁴ Further information for emerging economies is included in Figure 1 shows that sub-Saharan Africa has an average annual requirement of 10% of GDP, with some of the lowest income economies requiring as much as 15% of GDP investment a year.

The 2006 OECD report was prepared before the full scale of the changes required to global electricity grids to accommodate significant intermittent renewable electricity supplies (e.g. wind power or solar power) became fully apparent. Therefore, along with the conservative estimate for global water infrastructure investment need in Figure 33 it is suggested that annual infrastructure investment need is at least 4.50% of GDP (or about US\$ 3,550 billion in 2011 prices).⁷⁵ This estimate is a little higher than the estimate of US\$ 3,000 billion given in the 2010 World Economic Forum report *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*⁷⁶ partly due to each report basing estimates on a different pricing date.

Actual Investment Levels

Historically, however, less than half of the required amounts in emerging economies have been invested in infrastructure development and maintenance. This underinvestment results in much inefficiency.

Improve efficiency



In the electricity sector, 5% or more of the electricity generated is unnecessarily lost for technical reasons. In South Asia, power transmission and distribution losses amount to more than 20%. If these losses were reduced to the level of loss in advanced countries, the reduction would have the same effect as 30 gigawatts of new capacity being installed, or US\$ 50 billion being invested. Similarly, 25% to 40% of water is leaked from the network or is otherwise not accounted for in developing countries



African Development Bank, Asian Development Bank, et al. *Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure, Annex I*. 2011. p. 9.

Simply tackling the inefficiencies would improve growth and address poverty and inequality concerns. However, addressing efficiency gains alone is not sufficient and investment in new infrastructure in needed.

Poor infrastructure means poor growth prospects



The participants at the World Economic Forum on Latin America in São Paulo in April 2006 identified poor infrastructure as the major economic hindrance for the region’s ability to compete globally and one of the priority areas in which the Forum needed to explore alternatives and catalyse actions to overcome the current shortcomings



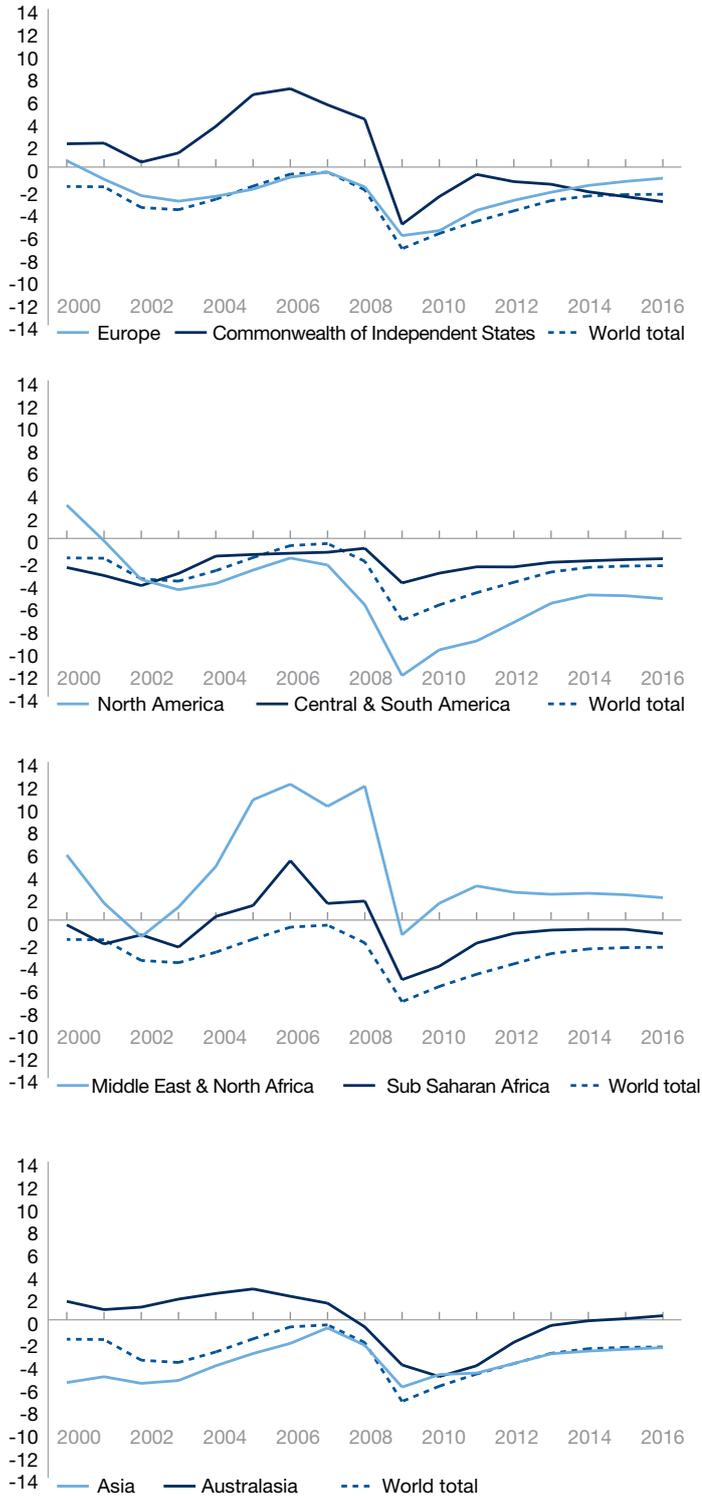
World Economic Forum. *Benchmarking National Attractiveness for Private Investment in Latin American Infrastructure*. 2007. p. 5.

IHS estimates that global construction expenditure on infrastructure (including power generation) in 2011 was US\$ 2,580 billion.⁷⁷ This leaves a global **infrastructure gap** of about US\$ 1,000 billion; similar to the estimate referred to in the 2010 World Economic Forum report, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*.⁷⁸

Fiscal Challenge of Tackling the Infrastructure Gap

Figure 34 illustrates IMF forecasts for fiscal deficits/surpluses for 2011-2016. As illustrated, apart from the North Africa and Middle East region, all other regions are expected to have fiscal deficits in most of the years. This will make it harder for governments to increase their expenditure on infrastructure to address the **infrastructure gap**.

Figure 34: Comparison of Government Fiscal Surpluses and Deficits (% of GDP*)



Source: IMF World Economic Outlook Database September 2011

* Note that if GDP or fiscal surplus/deficit information is not provided for a country in a particular year, both the GDP and surplus/deficit figures are removed for consistency.

Appendix 3

Infrastructure Asset Register Case Studies

When obtaining information about the current condition of taxpayer-funded and user-funded infrastructure assets governments should ideally collect:

- cartographical information about where all the **economic infrastructure** in a country is, and the total size of networks, e.g. how many kilometres of major roads, minor roads, railway lines and electricity distribution cables are there?
- information about the physical condition of the assets, e.g. are roads heavily potholed or in need of refurbishment?
- financial estimates of the value of infrastructure assets which can be presented in an infrastructure balance sheet
- information about the quality of infrastructure services, e.g. although airports may need significant investment, are service levels being maintained or not?

The Province of Ontario collects information about the first three aspects for taxpayer-funded infrastructure, and the case study from the United Kingdom illustrates how information about the quality of taxpayer-funded and user-funded infrastructure services is captured.

Case Study: Ministry of Infrastructure, Ontario

The Province of Ontario has worked over a number of years to develop a database of its public-sector infrastructure. It now expects other public-sector organizations, such as municipalities and universities, to prepare asset inventories and subsequent asset management plans.

The benefits from preparing a comprehensive asset database and asset management plans are significant. The Government of Ontario states that the benefits include:

- if not already set, the ability to define acceptable service level standards
- an ability to analyse current infrastructure service provision against these “service-led” expectations
- the determination of which assets are most critical for service delivery
- a realization that “proper repairs and maintenance can be a more cost-effective way to meeting service requirements than new asset acquisition”
- an opportunity to **release** cash where assets that are no longer needed can be sold
- where new assets are needed, or bottlenecks rectified, confidence that the selected proposal is the best solution.

Source: Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011. p. 86

Case Study: United Kingdom Infrastructure Performance Trends 2005-10

	Capacity access & availability	Asset or capacity utilization	Service quality & reliability	Asset condition	Reducing carbon intensity	Safety
Major roads	▶	▶	▲	▲	▲	▲
Rail	▲	▽	▲	▲	—	▲
Airports	▽	—	▽	—	—	—
Ports	▶	▽	▲	—	—	—
Electricity	▲	▲	▲	▽	▲	—
Gas	▲	▲	▽	▶	—	—
Communications	▲	—	▲	—	—	—
Water and sewage	▲	▲	▲	▲	—	—
Waste	▲	▲	▲	—	—	—
Flood risk management	▲	—	—	▲	—	—

Key

- ▲ Improving
- ▶ Constant
- ▽ Deteriorating
- N/A or data not available

Source: HM Treasury. *National Infrastructure Plan 2011*. November, 2011. p. 16



Appendix 4

How to Engage with Stakeholders: Frameworks Akin to the Decision Dialogue Process

Infrastructure planning is both analytically and organizationally complex because of the breadth of issues and the divergent views of the various stakeholders involved.

For such difficult decisions, private companies are increasingly using concepts akin to the Decision Dialogue Process to plan investments and develop strategies.⁷⁹ In formulating strategies and actionable plans, methods such as the Decision Dialogue Process split individuals into two groups:

- the decision-makers – in this case the government that makes the final decisions on **economic infrastructure** priorities
- the project team – that provides the expert insight to assist the decision-makers. In this case, the team should include representation from the wider stakeholder community to give legitimacy to the planning process.

While the **economic infrastructure** priorities and plans are being formulated, different groups of stakeholders will need to be approached depending on the phase of the planning cycle.

Stakeholder engagement helps not hinders

“

To create a path for cost-effective, efficient and sustainable infrastructure development, a multistakeholder approach is needed to align the partners and closely define, plan and execute an infrastructure plan. The evidence is that early engagement with stakeholders sets up a partnership that allows projects to be delivered more effectively and efficiently and, in so doing, creates a “win-win” in which infrastructure truly benefits society and boosts economic growth

”

World Economic Forum and International Chamber of Commerce. *G20 Task Force: Final Report*. September, 2011. p. 41

Decision Dialogue Processes and similar approaches typically have four planning phases: the Initiation Phase, the Vision/Goals Preparation Phase, the Portfolio Selection Phase and the Policy Change Phase.

a) The Initiation Phase

At the initiation phase the government, as decision-maker, must consider four issues:

- who the key stakeholders will be and to meet with them
- whether to set up an “*independent*” group of stakeholders to provide recommendations to government or whether it should also contribute and partake in these stakeholder meetings
- how the meetings will be led. If stakeholders are likely to hold polarized views, a facilitator should be employed to structure the discussion and keep it focused. The facilitator can either be a neutral moderator or a government official, depending on the political system in the specific country, although often neutral moderators can engender more open meetings.
- how to frame the issue. Project plans often get derailed because stakeholders operate with diverse perspectives and positions. Box 12 explains the importance of correctly marketing the stakeholder engagement process, making it clear what the task is and what the limits of the task are. For example, the challenge may be framed as considering the national **economic infrastructure** priorities for the next 40-50 years to ensure that the country remain competitive, while addressing environmental and social challenges.

Box 12: Marketing the Stakeholder Engagement Process

To be successful, governments need to spend time making sure the marketing of the engagement process, and the subsequent steps to plan finalization and implementation are carefully handled. Stakeholders should realize that the forum is an opportunity to raise concerns, but also an opportunity for them to understand more about the government’s ideas. They should be requested to come to the meeting ready for constructive debate, with the understanding that in the end it will be for the elected government to make the final decision.

The World Bank report, *The Role of Communication in Large Infrastructure: The Bumbuna Hydroelectric Project in Post-Conflict Sierra Leone*, 2006 provides further guidance.

By having a clear framework, if stakeholders are sidetracked into speaking about niche areas or localized issues, participants can be gently reminded that this is not the focus of the exercise.

b) The Vision/Goals Preparation Phase

At the Vision/Goals Preparation stage stakeholders should be drawn from the breadth of society to include NGOs, representatives from civil society, government and the private sector. Having representation from external stakeholders, in particular foreign companies and international frameworks, is also important.

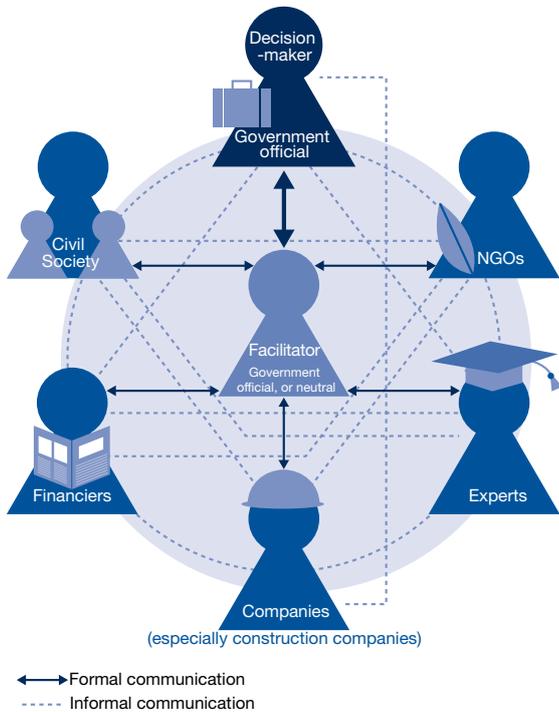
Although imagining 50 years into the future is difficult for such issues as the future of healthcare or computing, it is easier for **economic infrastructure** due to its long asset life. For example, it is likely that a road built in 10 years’ time will still exist in 50 years, even if modes of transport have changed. Further, asking stakeholders to think 50 years into the future encourages them to consider future generations, or the world when they are much older, which helps to soften political ideologies.

Figure 35 schematically shows how the government can configure the meeting, whether it wishes to set up an independent group of stakeholders or whether it will be involved in the project team as well.

In these figures, the black arrows (↔) represent direct communication between the stakeholder and the facilitator. Light blue dashed lines (---) represent informal bilateral discussions between two stakeholders, which can be an opportunity to widen one's perspectives and networks.

Figure 35: Vision Preparation Phase Options

...Government Involvement in Project Team



...Independent Advisory Group Reporting to Government

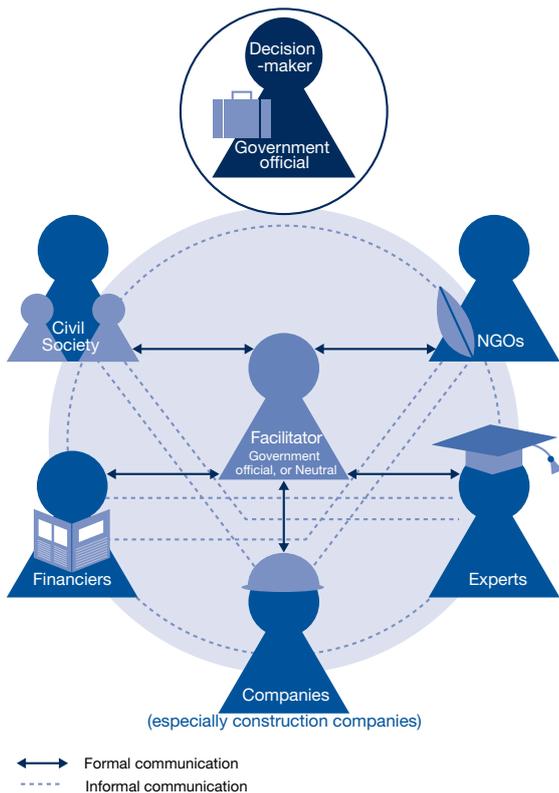


Figure 36 provides the advantages and disadvantages of whether to set up an independent advisory group or not, and Box 13 considerations for whether to engage other political parties in the process.

Figure 36: Advantages and Disadvantages of Government involvement in the Project Team

	Disadvantages	Advantages
Government as project team member	<ul style="list-style-type: none"> Some participants may not state their views freely 	<ul style="list-style-type: none"> Government gains first-hand insight into societal sentiment Having been heard by the decision-maker, stakeholders feel greater ownership of the results
Government sets up independent advisory board	<ul style="list-style-type: none"> When government (as decision-maker) finalizes the vision, stakeholders may feel less ownership of the result 	<ul style="list-style-type: none"> Engagement is wholly impartial Participants can freely state their views Greater possibility to engage with other political parties

Box 13: Whether to Engage Other Political Parties in the Process

If there is more cross-party consensus in finalizing an **economic infrastructure** plan stakeholders should have greater confidence that the plans will be delivered (albeit perhaps with some delay) whatever happens to the political landscape in the future.

While politicians may be loath to invite representatives from other political parties to the discussion, benefits can include greater chance of cross-party consensus over at least some of the issues.

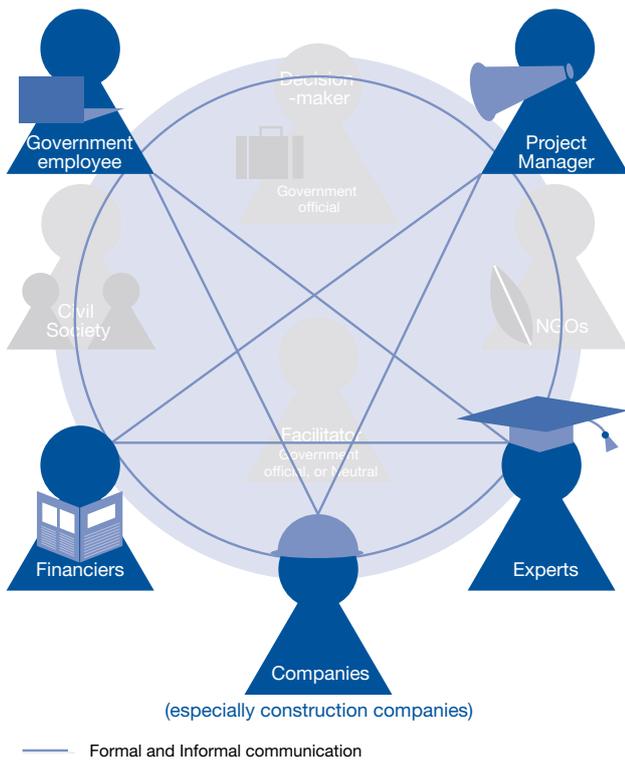
At the end of the meetings, the government will have gained the additional insight to formulate the **infrastructure vision** and a mid-term (circa 10-year) list of **infrastructure goals** that will progress the country towards achieving its long-term vision.

c) The Portfolio Selection Phase

At the Portfolio Selection Phase the 10-year **infrastructure goals** will then need to be converted into a realizable plan that actually selects the particular projects that will most cost-effectively deliver the goals.

As shown in Figure 37, various stakeholders will assist this detailed evaluation phase: government employees and government experts, construction companies and financiers (to understand in more detail the costs of various projects), other experts (e.g. academics) and project managers (who are likely to be government employees) to help create an actionable plan. Input from the general public and a wider stakeholder group is less likely at this phase.

Figure 37: Portfolio Selection Phase



As shown, both formal and informal communication between stakeholders is likely, as illustrated by a blue lines (—).

The Project Team will then present its suggestions to the decision-maker (the government official) who will either approve or amend the choices, after which the plan will be formally launched.

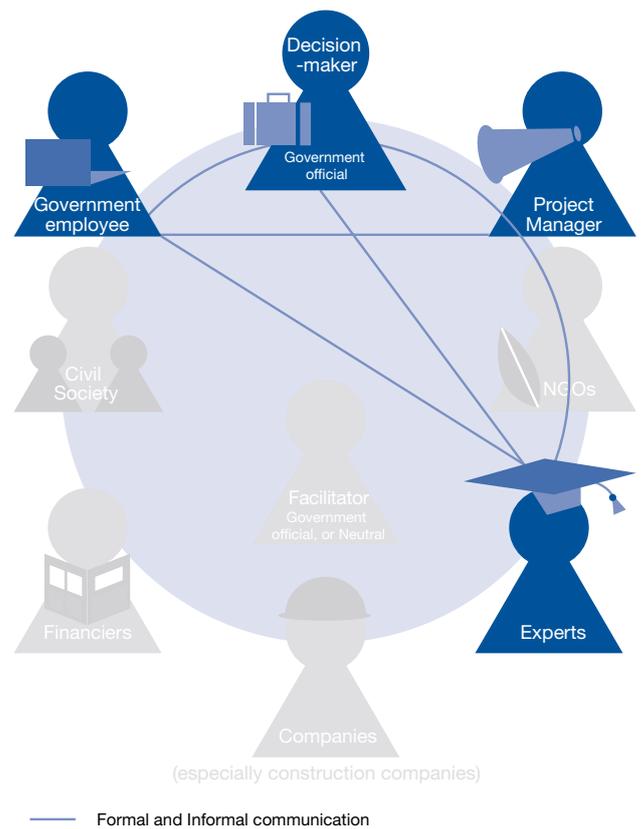
At this point, or at the Policy Change Phase, the Project Team will need to inform the stakeholders and society in general of its results and respond to questions the stakeholders may raise. Before the plan is formally published, stakeholders may be given a period of time to comment on a draft of the plan. It will not be possible to please everyone, and certain stakeholders will criticize parts of the finalized **infrastructure vision** for not fully encompassing their own views. However, hopefully they will feel that they have been full participants in the decision process and understand the rationale for the overall vision.

d) The Policy Change Phase

Once the plan is in place, the government may need to change a number of policies, rules, regulations and tax incentives to facilitate this investment.

Figure 38 illustrates the stakeholders needed to change policies and the enabling environment. Although the decision-maker (the government official) will give the final approvals, s/he is likely also to be a Project Team member.

Figure 38: The Policy Change Phase



Appendix 5

Findings from the Colombia Roundtable

On 28 November 2011, the Colombian Ministry of Trade, Industry and Tourism and Proexport Colombia hosted the World Economic Forum Competitiveness Workshop on Colombia in Bogotá. In the morning, participants heard the latest findings from the World Economic Forum’s *Global Competitiveness Report 2011-2012*. The afternoon programme was split into three parts:

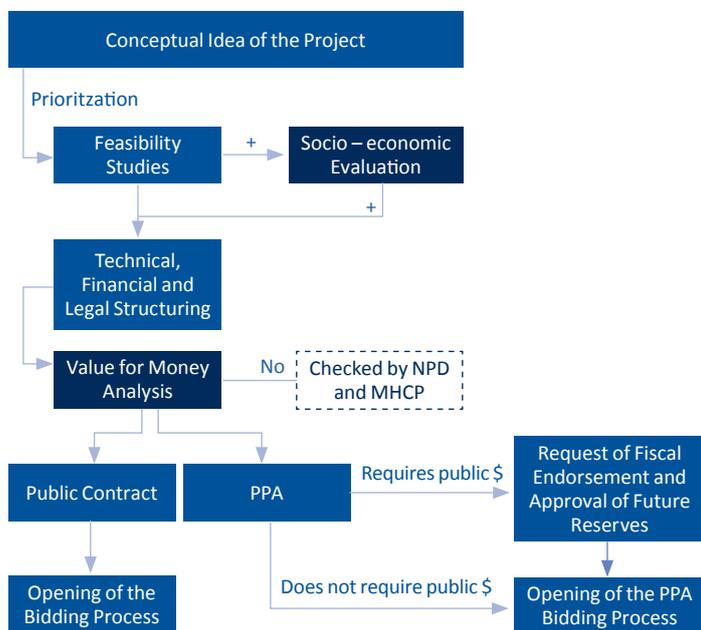
1. Presentations by the Government

Two presentations were given by the Ministry of Transport and the National Planning Department (DNP). The Ministry of Transport highlighted its transport plans to 2021, including plans to expand railway networks by 1,500 kilometres, upgrade 5,200 kilometres of motorway and develop the sea ports.

The DNP spoke about plans for other non-transport related infrastructure projects and the Public-Private Partnerships Bill that applies to all infrastructure sectors, which was to be presented to Congress in December 2011 (see Figure 39).

Figure 39: Colombian Bill Proposal for Public – Private Partnerships

Legal and Regulatory Framework: Public Initiative PPA Project - Flowchart



Source: National Planning Department, Government of Colombia, November 2011

2. Reflections by Infrastructure Experts

Three infrastructure experts spoke of the infrastructure challenges and solutions for Colombia, offering views on financing challenges, government transparency, the role of clear regulations and laws in attracting investors and construction companies, and labour supply imbalances. In addition, they shared their personal experiences of building infrastructure projects in the country.

3. The Participatory Strategic Infrastructure Process

Participants formed four groups, each with representatives from government, the private sector and civil society. They were asked to evaluate the quality of Colombia’s infrastructure and readiness for infrastructure investment using the 14 parameters of the World Economic Forum’s **Strategic Infrastructure Planner Tool**.

Stakeholders were instructed to rate each parameter on a scale of 0 to 10, with 0/10 indicating non-existent provision. 10/10 was referred to as the optimal situation for Colombia, given its current stage of development. Therefore, 10/10 does not necessarily mean cities will never experience congestion, nor that potable water is piped to every residence.

Participants were then asked to evaluate where Colombia will be on each parameter in 2021, with the expectation that Colombia’s existing infrastructure plans are fully implemented.

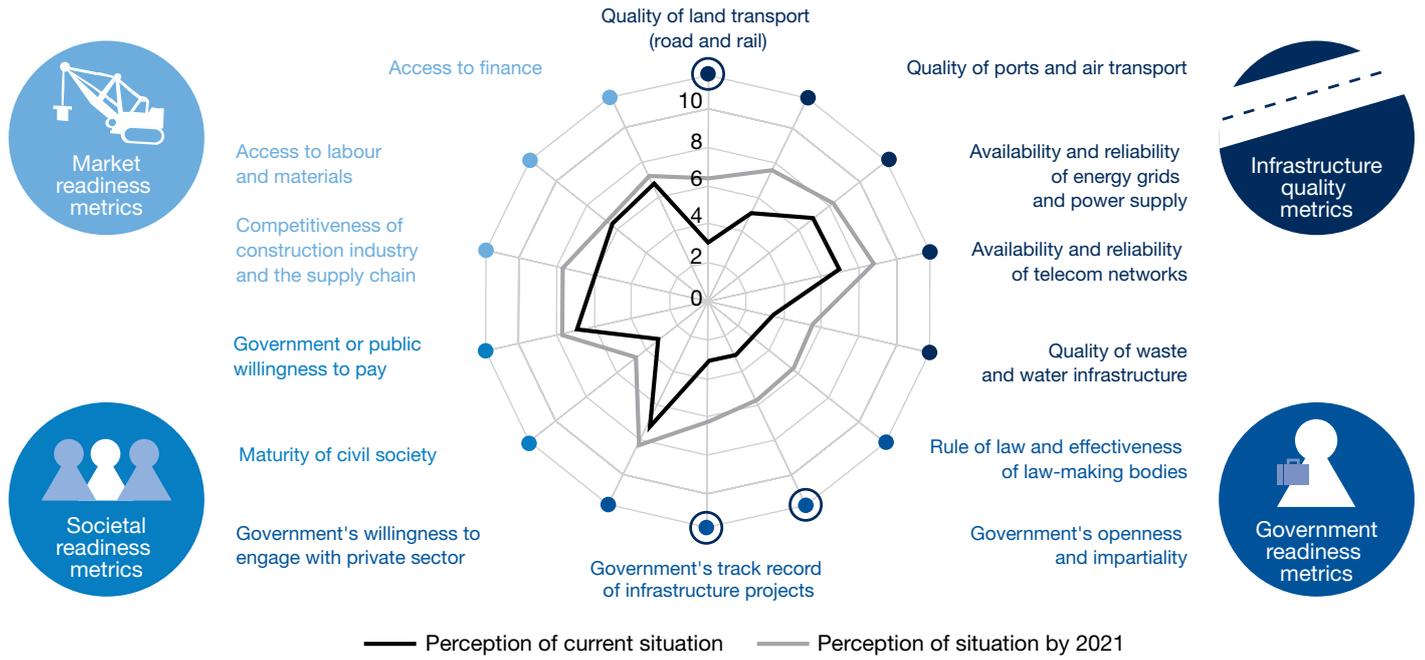
Results

Each group spent 45 minutes in lively debate, reviewing their perceptions of Colombia’s infrastructure based on the presentations and their personal knowledge. Each group was asked to reach consensus on the score for each parameter. Participants accepted the challenge with enthusiasm and in the spirit of wanting to help the government, with any criticism being made constructively. Participants commented that they learned a great deal from the dialogue.

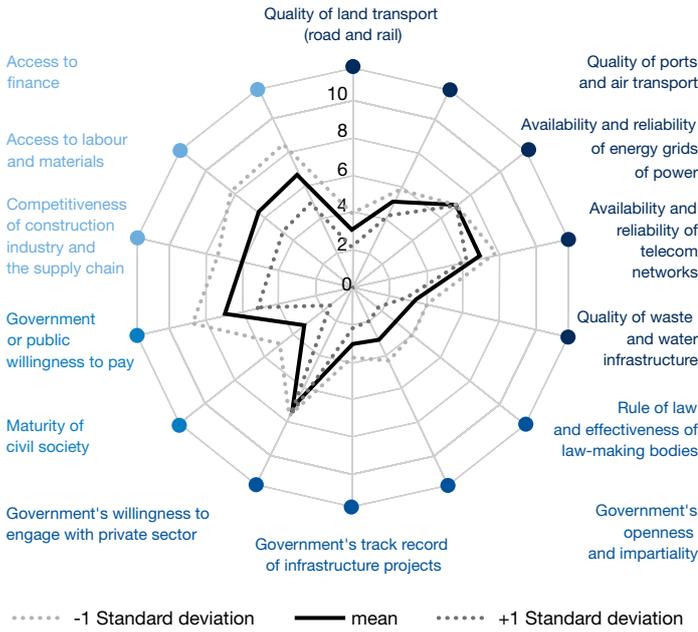
Figure 40 provides the summarized average (mean) results of the four groups. Large circles indicate where there is a difference of more than three points between the current and the 2021 situation. As each group had different views on many of the parameters, standard deviations around the mean are also provided, although it is acknowledged that the sample size of the four groups reduces the statistical significance of results.

Figure 40: Average results from the four groups of stakeholders

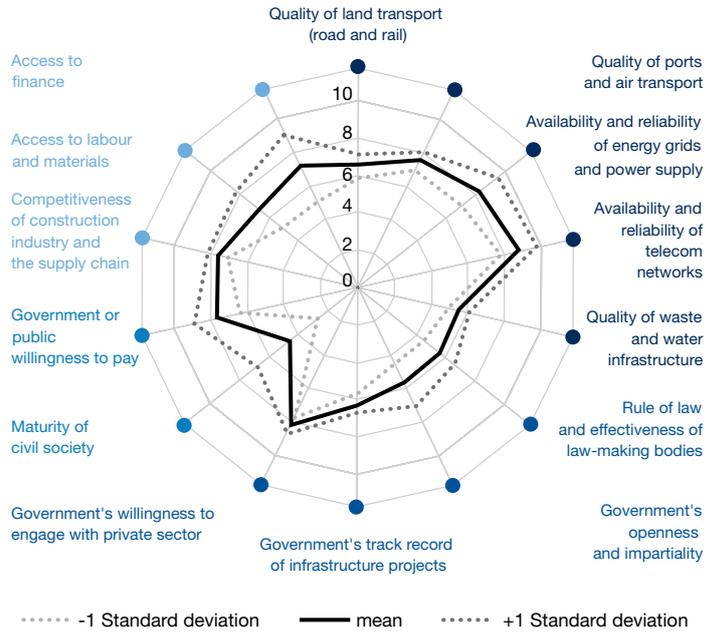
Colombian stakeholders perceptions of current situation and perception of the situation by 2021



Colombian stakeholders perception of the current situation, showing confidence intervals



Colombian stakeholders perception of the situation by 2021, showing confidence intervals



The Key Messages from Stakeholders

- a) At present, participants see the biggest constraints (with scores of less than 4/10) as:
- quality of land transport (road and rail)
 - quality of waste and water infrastructure
 - rule of law and the effectiveness of law-making bodies (but this will be improved with the Public-Private Partnerships Bill)
 - government's openness and impartiality in awarding tenders
 - government's track record of infrastructure projects, partly due to the historical legacy of underinvestment in the country
- b) If the government's current infrastructure plan is implemented, the metrics for all 14 parameters will improve, but with continued underperformance (scores of less than 6/10) in:
- quality of waste and water infrastructure
 - rule of law and the effectiveness of law-making bodies, even with the Public-Private Partnerships Bill enacted
 - government's openness and impartiality in awarding tenders
- c) As expected, the standard deviations are wider for:
- the more subjective parameters (the four Government Readiness Metrics, two Societal Readiness Metrics and three Market Readiness Metrics) than the five Infrastructure Quality Metrics
 - the future 2021 expectations than the current perceptions
- d) To achieve the 2021 vision, the government needs to concentrate on:
- upgrading the quality of land transport, with reference to the recent flooding in Colombia that has severely damaged a number of key link roads in the country
 - reducing the perceptions of not being impartial
 - improving its track record of delivering successful infrastructure projects on time and at cost. Much is hoped for from the new National Infrastructure Agency (ANI) that is replacing the National Concessions Institute (INCO); participants were keen for ANI and the government to focus on three or four priority projects
- e) Secondary areas to focus on are:
- improving the rule of law and the effectiveness of law-making bodies
 - enhancing the functioning of ports and airports

These messages need a caveat that, if ANI and the government are unable to deliver the 2021 plan, the perceptual scores could well be less. The government therefore should be evaluated not on the number of agencies and processes set up, but on a track record of successful projects. Ensuring that government bodies are staffed with professionals with a “*can do*” attitude and the importance of the infrastructure plan being driven by the president were emphasized.

Participants expressed concern that the government does not have the balance of infrastructure projects right and that some projects are not properly interlinked, which is an inefficient use of resources.

One example of a “*quick win*” is to improve the connection times of public transport networks.

Next Steps

After the session, the World Economic Forum team met with the Ministers of Planning, Mining & Energy and Housing & Urban Development. The Government of Colombia wishes to maintain the dialogue with the World Economic Forum and is discussing the formation of an Infrastructure Task Force comprising a number of government departments, private-sector companies and NGOs. The task force would recommend a series of actions to address the five issues that emerged using private-sector and international best practices.

Subsequent to the session, the Public-Private Partnerships Bill was approved in January 2012, which creates new opportunities.

Learning Points

This was the first time the **Strategic Infrastructure Planner Tool** was tested in a “*live*” setting and feedback indicates that the tool is useful and actionable. Participants expressed their support for further roundtables in other countries.

The four main learning points were:

- a) The participation of high-ranking government officials in similar roundtables will emphasize the importance of infrastructure and give investors and engineering companies increased confidence
- b) Roundtables need to be marketed widely, especially to local companies. As well as being able to offer their feedback and useful networks, ties and linkages can be formed with foreign investors and engineering companies
- c) Stakeholders should be given more time to discuss their different perceptions
- d) The presentations by the government and infrastructure experts were made before the task and the **Strategic Infrastructure Planner Tool** was explained. Participants said that they would have preferred hearing about the exercise before the presentations.

Appendix 6

Evaluation of Projects: Further Guidance



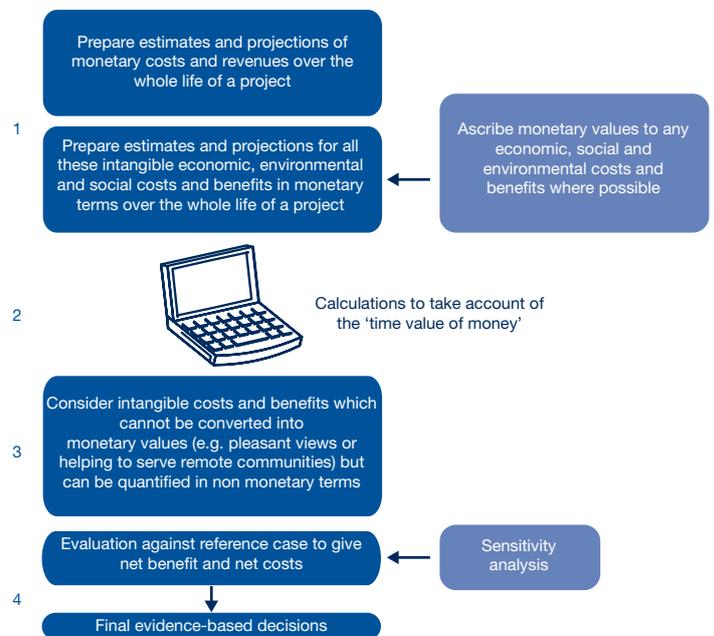
This Appendix is split into three parts:

- An explanation and example of how CBA is undertaken
- A brief summary of some other evaluation methodologies and a comparison of CBA to these methodologies
- A technical annex that provides a more academic discussion of the issues governments should consider when determining the rate of return the government, on behalf of society, should use to evaluate projects.

An explanation and example of how to undertake cost benefit analysis

Figure 10 in Section A.4 of the report (replicated below) summarized the four main steps that are required in a CBA.

Figure 10: Four Steps of Cost Benefit Analysis



- Step 1: For each shortlisted potential solution calculate all the monetary costs and benefits over the project life, and wherever possible ascribe monetary values to economic, environmental and social benefits that are not priced by the market. As explained in Section A.3, there is discussion about the time period these costs and benefits should be calculated. The general advice is that they should be calculated over a period to enable a consistent comparison of all the projects, ideally being the economic life of the most durable option. However, in cases where one project lasts for a very long time (maybe 150 years) and others last for shorter periods of time (maybe 25 years) a pragmatic approach could be to evaluate all options over 50 years time. This would require making an assumption of the asset value of the long lasting project option in year 50 and making an assumption about what could happen when the shorter term projects reach the end of their useful economic lives, which maybe building an equivalent replacement asset).

Box 14 provides an example of the monetary costs and benefits that need to be included for each potential project.

Box 14: Calculating Monetary Costs and Benefits for Each Potential Project Being Considered

For each potential project the government will need to prepare estimates and projections of the monetary costs and revenues over a consistent time period. The government will either use its own in-house engineers and quantity surveyors or may employ a technical adviser. At this point the advisers may try to estimate costs to within a ±10% or a ±5% degree of accuracy starting off using industry average construction costs per kilometre or costs per square metre or other metrics. To obtain high level estimates is harder if such industry data is not available, for example, in small emerging economies. In these cases, data from neighbouring countries may need to be used. Lifecycle and maintenance costs will also need to be reviewed and projected. An example of a cost profile that may result is illustrated below.



On the revenue (benefit) side thought will need to be given to the potential revenue that can be obtained from the services the infrastructure will provide. For some projects paid for and funded by government there may be no revenue above and beyond monies the government provides, but for other projects there may be opportunities for third party revenue sources. For example, when building a new metro station it may be possible for the developer to build an adjacent retail area which can be leased out to new companies.

As with the monetary costs and benefits, it is possible to estimate the financial impact of some economic, social and environmental implications, such as:

- the health benefits of reduced pollution, by calculating how much it costs to treat a patient in hospital and the loss in productivity while that person is ill
- the time savings that projects can generate, meaning transport logistics and other companies can be more productive
- the costs of decommissioning sites, such as rectifying contaminated land which is often not priced in the market.

Box 15 provides further detail of how monetary values are imputed for intangible benefits and costs.

Box 15: Economic Techniques to Impute Monetary Values to Certain Intangible Benefits and Costs

The monetary conversion of intangible elements, such as noise and access to natural light, is often difficult and controversial.

However, methods to impute a monetary value to some intangible benefits and costs exist. Although preparing guidance on how to value them requires advice from economists, once the values have been estimated the application is much easier. Two main approaches exist:

- **Revealed preference:** This approach infers a society's willingness to pay for an intangible benefit (or to accept compensation for an intangible cost) by observing how society values a similar benefit (or cost). For instance, carbon trading could provide a rough approximation for a society's willingness to pay for carbon reduction. Complex economic modelling techniques can also be used to help infer willingness to pay for benefits or to accept compensation based on past behaviours. The challenge for the revealed preference approach is that it is critical to select comparable and relevant cases.
- **Stated preference:** Where it is not possible to infer implicit values with the revealed preference approach, the stated preference approach is often used. It requires undertaking interviews and surveys to elicit a society's willingness to pay for a hypothetical benefit (or to accept compensation for a cost) that can result from the proposed infrastructure project. For instance, a survey can be distributed to villagers asking them how much they are willing to pay to save 30 minutes of driving time. The challenge is that participants may not reveal their true value as the question is hypothetical, or the survey may not be representative.

The United Kingdom's HM Treasury Green Book provides detailed information about the techniques and values used in the United Kingdom, but these imputed values apply for a developed economy. The imputed values in emerging economies will typically be less.⁸⁰

Figure 41 provides a simplified hypothetical example of the CBA of a bridge project connecting towns on two sides of a gorge over the bridge’s 40-year lifespan. As well as the costs of building and maintaining the bridge, drivers who use it will save 1.5 million hours a year in travel time, and carbon emissions will be reduced by 100,000 tonnes. For illustration purposes, the figures are presented in **real terms**, which are dollar prices once the effects of inflation have been removed.

Figure 41: Step 1: Cost Benefit Analysis Example (Real Terms)

COST CALCULATION		BENEFIT	
Cost (US\$ m)	Benefit in first 40 years	Conversion rates	Benefits over 40 years in monetary terms (US\$ m)
Land acquisition and preparation : 10	Tolls collected from 3 million cars per year	Toll price is US\$1/car	120
Construction: 80	Travel time reduced by 1.5 million hours per year	Time is valued at US\$5/hour	300
Maintenance (1 per year for 40 years): 40	Carbon reduction of 100,000 tonnes per year	Carbon is traded at US\$5/tonne	20
Total Cost: 130	Total Benefit: 320		
Net Benefit: US\$190 million			

Financial analysis alone indicates that if tolls of US\$ 1 per vehicle can be charged, this project will result in a net loss of US\$ 10 million as the total cost is US\$ 130 million and the toll revenues are US\$ 120 million. Nonetheless, subject to validating the projected traffic forecasts and the other values, a comprehensive CBA that factors in societal and environmental benefits, such as carbon reduction and time savings, demonstrates that this project would generate a net return of US\$ 190 million to society over its 40-year lifespan. This is because the project will save US\$ 300 million in travel time and save US\$ 20 million of carbon emissions. While drivers have to pay US\$ 120 million in tolls, this can be thought of as a transfer of some of their US\$ 300 million of time savings to the toll operator. If one added up the toll receipts and the total value of time savings, this would double-count some of the benefits.

- **Step 2: Discounting the benefits and costs.** Just as private companies must account for interest on the loans they take out and for returns that investors require, so in a CBA a similar approach, **discounting**, is necessary.

Discounting converts streams of cost and revenue values from different time periods to values at a common time reference point (with the reference point often being today – the “*present value*”). **Discounting** is needed because of the “*time value of money*” (society prefers to receive a dollar today than a dollar in five years’ time). A **discount** rate is used to conduct the discounting exercise, with further detail about how to **discount** costs and benefits in Box 16.

Box 16: How to discount costs and benefits

Future benefits and costs need to be **discounted** to reflect their true values in relationship to today’s benefits and costs – the **Net Present Value (NPV)**.

Box 17 provides **discounted** numbers for the gorge example, but the general process of **discounting** is represented by the formula:

$$NPV = \frac{B_0 - C_0}{(1+r)^0} + \frac{B_1 - C_1}{(1+r)^1} + \frac{B_2 - C_2}{(1+r)^2} \dots + \frac{B_n - C_n}{(1+r)^n}$$

Where:

- NPV = Net Present Value r = Discount rate (%)
- B_n = Benefit in year n n = Number of years from the initial investment in Year 0
- C_n = Cost in year n

The net costs and benefits of the *n*th year, B_n – C_n, are **discounted** by the **discount** factor, $\frac{1}{(1+r)^n}$.

For instance, the net costs and benefits for the second year, B₂ – C₂, is **discounted** by using the **discount** factor, $\frac{1}{(1+r)^2}$.

The NPV is the sum of all these net costs and benefits from different time periods after they are **discounted** by their respective **discount** factors.

The **discount** rate could be a “*nominal*” **discount** rate, meaning it as not been adjusted for inflation over time. Alternatively, it could be adjusted for inflation - a **real discount** rate.

As explained in the Annex to this Appendix, the choice of appropriate discount rate is subject to much academic debate, but it is accepted that society’s discount rate should be lower than that for most private individuals, principally because individuals tend to have shorter investment time horizons.

Using the gorge bridge example, the toll income stream expected over the next 40 years should be discounted to the present value to properly compare the future income stream to the costs incurred today. This also applies to other future cost and benefit streams, such as maintenance costs, the benefits from carbon reduction and the savings in travel time. The costs and benefits in Figure 41 are in real terms. Figure 42 illustrates the effects of using a 4% real annual discount rate, which gives a net benefit of US\$ 48 million. Again the toll receipts have not been included in the final NPV calculations as that would involve double-counting. The detailed mathematical calculations are illustrated in Box 17

Box 17: Gorge Bridge Discounting Calculations

Using Figure 42 assumptions and Year 8 maintenance costs as an example the first step is to calculate the Year 8 discount factor:

$$\frac{1}{(1 + 0.04)^8} = 0.731$$

As the real maintenance cost in Year 8 is US\$ 1 million the discounted cost is US\$ 0.731 million (US\$1 million × 0.731).

Year	Discount Factor (4% annual real discount rate)	Discounted Cost			Discounted Benefit		
		Land Acquisition/Preparation	Construction	Maintenance	Tolls	Travel Time Saved	Carbon Reduction
0	1.000	-10.0	-80.0				
1	0.962			-0.962	2.885	7.212	0.481
2	0.925			-0.925	2.774	6.934	0.462
3	0.889			-0.889	2.667	6.667	0.444
4	0.855			-0.855	2.564	6.411	0.427
5	0.822			-0.822	2.466	6.164	0.411
6	0.790			-0.790	2.371	5.927	0.395
7	0.760			-0.760	2.280	5.699	0.380
8	0.731			-0.731	2.192	5.480	0.365
9	0.703			-0.703	2.108	5.269	0.351
10	0.676			-0.676	2.027	5.067	0.338
11	0.650			-0.650	1.949	4.872	0.325
12	0.625			-0.625	1.874	4.684	0.312
13	0.601			-0.601	1.802	4.504	0.300
14	0.577			-0.577	1.732	4.331	0.289
15	0.555			-0.555	1.666	4.164	0.278
16	0.534			-0.534	1.602	4.004	0.267
17	0.513			-0.513	1.540	3.850	0.257
18	0.494			-0.494	1.481	3.702	0.247
19	0.475			-0.475	1.424	3.560	0.237
20	0.456			-0.456	1.369	3.423	0.228
21	0.439			-0.439	1.317	3.291	0.219
22	0.422			-0.422	1.266	3.165	0.211
23	0.406			-0.406	1.217	3.043	0.203
24	0.390			-0.390	1.170	2.926	0.195
25	0.375			-0.375	1.125	2.813	0.188
26	0.361			-0.361	1.082	2.705	0.180
27	0.347			-0.347	1.040	2.601	0.173
28	0.333			-0.333	1.000	2.501	0.167
29	0.321			-0.321	0.962	2.405	0.160
30	0.308			-0.308	0.925	2.312	0.154
31	0.296			-0.296	0.889	2.223	0.148
32	0.285			-0.285	0.855	2.138	0.143
33	0.274			-0.274	0.822	2.056	0.137
34	0.264			-0.264	0.791	1.977	0.132
35	0.253			-0.253	0.760	1.901	0.127
36	0.244			-0.244	0.731	1.828	0.122
37	0.234			-0.234	0.703	1.757	0.117
38	0.225			-0.225	0.676	1.690	0.113
39	0.217			-0.217	0.650	1.625	0.108
40	0.208			-0.208	0.625	1.562	0.104
Subtotal		-10	-80	-20	59	148	10
Net Benefit = 58			Total Cost	-110		Total Benefit	158

Figure 42: Step 2: Cost Benefit Analysis Example (Real Terms) With Discounting

COST CALCULATION		BENEFIT	
Actual Cost	Cost discounted over 40 years at 4% per year	Actual Benefit	Benefit discounted over 40 years at 4% per year
Land acquisition & preparation : 10	Land acquisition & preparation : 10	Tolls collected from cars: 120	Tolls collected from cars: 59
Construction: 80	Construction: 80	Travel time savings:300	Travel time savings:148
Maintenance (1 per year for 40 years): 40	Maintenance (1 per year for 40 years): 20	Reduction in carbon emissions:20	Reduction in carbon emissions:10
Total cost: 130	Total discounted cost: 110	Total benefit: 320	Total discounted benefit: 158
Discounted Net Benefit/Net Present Value: US\$48 million			

Step 3: Accounting for intangible costs and benefits that cannot be converted into monetary terms. Despite different ways of imputing monetary values for intangible costs and benefits, some elements cannot easily be quantified.

When intangible costs and benefits cannot be monetized, a qualitative evaluation of these elements is recommended to supplement the results of the CBA. One widely used method is called multicriteria analysis. It involves:

- weighing a set of different qualitative criteria that is important to the local community
- scoring the candidate projects against these criteria
- aggregating the scores for an overall qualitative evaluation.

Whereas monetary values are objective, multicriteria analysis is perceptual and is best conducted by engaging with local stakeholders.⁸¹

Using the same hypothetical example of four candidate strategic infrastructure projects, the local stakeholders may propose three qualitative criteria with different weights (w), scoring each project from 0-10 against the criteria shown in Figure 43.

Figure 43: Qualitative Scoring of Projects' Intangible Aspects

Strategic Infrastructure Candidate Projects	Criterion 1: improving overall integration with the wider region (w=10)	Criterion 2: improving mobility of the under-served population (w=15)	Criterion 3: creating a visually pleasing landmark (w=5)	Overall Score
Gorge bridge	10×10	6×15	10×5	240
Tunnel	10×10	5×15	3 × 5	190
Road expansion	6×10	8×15	2×5	190
New roads	7×10	10×15	1×5	225

This qualitative analysis concludes that the gorge bridge will best meet the qualitative criteria of integrating with the greater region, improving mobility of the under-served population and creating a visually pleasing landmark.

Caution needs to be taken to ensure that the qualitative evaluation is carefully designed and implemented to minimize bias, and that it reflects the preferences of the population near the crossing point. For example, the result would change if the weight for the criterion of improving mobility of the underserved population was 17 rather than 15. As explained in Step 4, sensitivity analysis of the financial and these intangible benefits that cannot be converted into monetary terms should be performed to understand these differences in more detail.

– Step 4: Final evaluation and decisions.

The final evaluation will depend in part on whether all the intangible costs and benefits can be translated into monetary values or whether there are some intangible costs and benefits (e.g. noise or a pleasant view) that cannot easily be translated.

Choices if All Intangible Costs and Benefits Can Be Converted into Monetary Values

Each option's discounted costs and benefits need to be compared with the discounted costs and benefits of the **reference case** over the same evaluation period as illustrated in Figure 44. Put another way there is a need to compare the NPV of each option to the NPV of the **reference case**.

Figure 44: Net Present Value Compared to Benefit/Cost Ratios

	Project A	Reference Case	Difference between Project A and the Reference Case
NPV of Benefits	B _A	B _R	B _A - B _R
NPV of Costs	C _A	C _R	C _A - C _R
Net Benefit	B _A - C _A	B _R - C _R	B _A + C _R - B _R - C _A

This gives an indication of the additional or marginal impact of the new investment. Governments can then prioritize investments based on:

- projects with the highest net NPV (B_A + C_R - B_R - C_A) when compared to the **reference case**
- projects with the highest BCRs. BCRs are calculated as follows:

$$\frac{\text{NPV of the difference in benefits at a defined discount rate (B}_A - B_R)}{\text{NPV of the difference in costs at a defined discount rate (C}_A - C_R)}$$

A ratio greater than 1.0 means that the project generates more benefits than costs. Projects are then chosen on the basis of those that generate the highest ratio greater than 1.0, or

- an analysis of the total NPV and the BCRs.

Both approaches have their merits; which is more suitable depends on the situation. For instance, a government faced with funding limitations may opt for the project with the highest BCR, while a government that is not cash-constrained and wants to maximize the benefits would choose the net NPV approach.

Assuming that the hypothetical costs and benefits in Figure 45 are the net costs and benefits over and above the reference case, the tunnel project would be chosen if the net NPV is used for prioritization, although the new roads project would be preferred if the BCR approach is selected.

Figure 45: Prioritizing Four Projects Where All Costs and Benefits Can Be Monetized

Strategic Infrastructure Candidate Projects	Net Present Value (NPV) (US\$ m)	Priority Ranking Using NPV	Benefit/Cost Ratio	Priority Ranking Using Benefit/Cost Ratio
Gorge bridge	48	2	1.44	3
Tunnel	90	1	1.30	4
Road expansion	30	4	1.80	2
New roads	40	3	2.15	1

It is common to rigorously re-evaluate the elements with the highest potential impact on the projected costs and benefits before policy-makers make final decisions. For example, was there optimism bias in any of the benefit assumptions? If three or four possible solutions are being evaluated, have consistent assumptions been made in all cases? Reviewing assumptions and conducting **sensitivity analyses** using realistic evidence-based examples will also help planners to consider risks and risk mitigation strategies for the project that is eventually chosen. Box 18 provides further guidance about **sensitivity analysis** and Appendix 7 provides further information about risk analysis and risk mitigation.

Box 18: Sensitivity Analysis

Sensitivity analysis has increasingly become a standard step in CBA to properly understand and account for uncertainties in long-term, large-scale project evaluation and prioritization. It is an especially helpful exercise to test the CBA assumptions and to identify which assumptions could have critical impacts on the project's net benefit.

Using the gorge bridge example, the current assumptions are treated as a baseline in the sensitivity analysis. Then, using realistic assumptions, a more optimistic (for simplification, +5% of baseline) and pessimistic level (-5% of baseline) are calculated.

Pessimistic Assumption (-5% of baseline)	Baseline Assumption	Optimistic Assumption (+5% of baseline)
Tolls collected from 2.85 million cars per year	Tolls collected from 3 million cars per year	Tolls collected from 3.15 million cars per year
Travel time savings of 1.42 million hours per year	Travel time savings of 1.5 million hours per year	Travel time savings of 1.58 million hours per year
Carbon reduction of 95,000 tons per year	Carbon reduction of 100,000 tons per year	Carbon reduction of 105,000 tons per year

To test how sensitive the gorge project's net benefit is, only one of these assumptions is tested at a time by moving it to either the pessimistic or optimistic level while holding all the other assumptions constant. In effect, six mini-scenarios are created off the baseline. However, it is important not only to run sensitivities at say ±5% and ±10% but also at sensitivities that are realistic. If there are more variables, a sensitivity analysis should be conducted on all key components.

In reality all governments have budget constraints, so if projects are evaluated over the same time period governments tend to prioritize based on the highest BCRs. However, care needs to be taken if decisions are made solely on the basis of BCRs because exactly how impacts are treated is important. An example to illustrate this could be the case where there are on average 10 serious accidents a year on a road with many blind spots. To rectify this, the government builds a new road with no blind spots but keeps the old road operational. With most traffic diverted to the new road there may now be only two serious accidents on the old road and two serious accidents on the new road. If a monetary amount can be placed on the value of a serious accident (in terms of lost income or incapacity benefits), an evaluation of the costs and benefits of this option reveals that:

- the net benefit is six fewer serious accidents a year
- there will be a net benefit of eight fewer accidents a year on the old road, but the new road will have a cost impact from the two accidents.

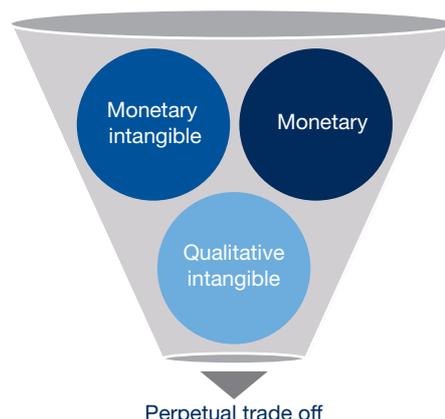
From an NPV perspective, both approaches result in exactly the same answer, but the BCR could produce differences depending on how the analysis is undertaken.

Even when evaluations are done over similar timeframes it must be realized that neither the summarized NPV number nor the BCR explains which parties bear the costs and benefits, nor indicates the exact timing of costs and benefits. For example, in the gorge bridge example an upfront capital injection of US\$ 90 million is required, and the additional costs of US \$ 40 million (or US\$ 20 million in NPV terms) are incurred over the following 40 years. However, the benefits of US\$ 320 million (or US\$ 158 million in NPV terms) occur more evenly over the operational period.

Choices if All Intangible Costs and Benefits Cannot Be Converted into Monetary Values

If all intangible costs and benefits cannot be converted into monetary values, both the monetary and multicriteria qualitative analyses are required as illustrated in Figure 46. This combines the monetary costs and benefits, the intangible costs and benefits which can be converted into monetary terms (from Figure 42) and the qualitative scores for those intangible costs and benefits that cannot be converted into monetary terms (from Figure 43).

Figure 46: Prioritizing a Project for which Costs and Benefits Cannot Be Monetized



Strategic Infrastructure Candidate Projects	NPV (US\$ m)	Priority using NPV	Benefit/Cost Ratio	Priority Benefit/Cost Ratio	Qualitative Score	Qualitative Rank
Gorge bridge	48	2	1.44	3	240	1
Tunnel	90	1	1.30	4	190	3
Road expansion	30	4	1.80	2	190	3
New roads	40	3	2.15	1	225	2

Assuming that the government is cash-constrained, then rather than consider the NPVs the evaluation team needs to balance which is better – the new roads project, which has the highest BCR, or the gorge bridge, which has the highest qualitative evaluation. Neither the tunnel nor the road expansion would be considered because in both cases a better solution that offers additional benefits is possible.

As with the monetary costs, **sensitivity** analysis will also need to be performed on the qualitative factors which cannot be translated into monetary terms.

The final decision will depend on the views of the evaluation team, weighing up the quantitative monetary calculations and the qualitative evaluation. Although it may seem that ultimately the final decision is subjective, CBA provides a methodology where all material factors will have been considered, and by presenting results transparently the evaluation team can provide a robust evidence-base for their decision.

In conclusion, while the gorge bridge example presented has been simplified, it demonstrates the big advantages and shortcomings of a CBA. CBA provides a consistent and accessible method that includes societal and environmental considerations and, if clear guidance is given, can be adopted for use on all large government projects. On the other hand, this method bears the shortcoming of trying to convert (intangible) costs and benefits into monetary terms, which can raise critique.

Further guidance

Some countries, such as the United Kingdom and Canada, have produced manuals to help practitioners conduct CBAs. In particular, the United Kingdom government has recently produced supplementary guidance to its Green Book with prioritization advice specifically covering infrastructure evaluation.⁸²

In addition, textbooks and academic and research journals are devoted to the advancement of CBA techniques. Appendix 17 contains references to some of these sources including Boardman et al, Burgess, Burgess and Jenkins, the United States of America Congressional Budget Office, HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* and HM Treasury's Valuing Infrastructure Spend.

Alternative Evaluation Methods from the Cost Benefit Analysis and Advantages and Disadvantages of the Cost Benefit Analysis Methodology

Although this Report focuses on CBA as the method to analyse financial, societal and environmental benefits, two other evaluation methods are commonly used:

- **Cost-effectiveness analysis:** The primary difference between CBA and **cost-effectiveness analysis** is the latter typically circumvents the critical step of converting benefits (and sometimes costs) into a single monetary unit. Instead, benefits are converted to a non-monetary common unit (e.g. number of fatal accidents avoided). This method is especially useful when the objectives of candidate projects are similar and the objectives are difficult to measure using monetary values.

For instance, a dangerous road has become a traffic black spot. Three strategic projects might be considered to reduce traffic fatalities: a road realignment at certain points; road widening on the whole route; and traffic-calming measures with speed restrictions. If attempting to ascribe monetary values to fatalities is contentious, Figure 47 summarizes what a **cost-effectiveness analysis** might look like, with the traffic-calming approach preferred because for each US\$ 1 million spent the traffic-calming approach will save the most lives over the 40-year project.

Figure 47: Example of Cost Effectiveness Analysis

Strategic Infrastructure Candidate Projects	Total benefits (estimated number of fatalities avoided in 40 years)	Total cost (US\$m, real terms)	Cost Effectiveness Ratio (fatality avoided per \$m transportation investment)	Priority Ranking using Benefit/Cost Ratio
Road realignment	540	189	2.86	2
Road widening	680	295	2.31	3
Traffic calming	245	74	3.31	1

As shown, **cost-effectiveness analysis** provides a straightforward method to evaluate benefits and costs that are often difficult or controversial to convert into monetary terms, such as human lives, public health and environmental benefits.

- **Input-output analysis:** This analysis provides a sophisticated method to evaluate economic, social and environmental benefits of projects and to understand how the project will interact with other economic sectors. However, it should not be used on its own, but rather to augment other analysis. It initially requires establishing an **input-output** accounting matrix, which is often already available from national and regional GDP accounts. It models the detailed impacts of candidate projects on different sectors using the multipliers of the **input-output** matrix. While this analysis method requires significant technical capability there are many commercially available models, such as REMI, RIMS-II and IMPLAN.

Various examples in this Appendix have showcased certain advantages of the CBA method, including:

- **Consistency:** CBA can be systematically applied to different candidate projects of varied sizes, locations and time horizons. This consistency is important to minimize personal and political biases and can significantly improve the objectivity of the evaluation and prioritization process.
- **Accessibility:** Despite the fact that CBA has a theoretical underpinning, relying partly on economic valuations of non-monetary costs and benefits, once governments have prepared methodologies (or adopted existing methodologies) the technique is quite straightforward to apply. This is especially beneficial for organizations with technical expertise constraints.
- **Economical:** Compared to other more complex methods requiring upfront investments in modelling, computation hardware, data collection and consultancy, the CBA method is much easier to apply requiring little upfront resource commitment beyond clear manuals and training material.

All methodologies inevitably have limitations. Being aware of the shortcomings of CBA methods can help practitioners to avoid potential pitfalls. Some of the most common criticisms include:

- **Unitary measurement:** A CBA converts intangible costs and benefits into monetary values, which assumes a consensus on certain values across cultures, age groups, genders, locations and time. This assumption can be especially problematic for large-scale, long-term infrastructure projects, with enduring and far-reaching impacts where the affected communities are diverse.
- **Intangible benefits and costs:** Methodologies that convert intangible costs and benefits into financial terms often rely on some subjective judgement. This process can lead to substituting values that may be under or over the true values.
- **Distributive effects:** The CBA evaluates aggregate impacts, but it is unable to determine how the costs and benefits are allocated. Techniques are available to measure social equity, but the results of these techniques are not ideal.

Technical Annex – Choosing an Appropriate Discount Rate

Whereas the arithmetic of discounting is relatively straightforward, the choice of an appropriate **discount** rate for publicly funded projects is a contentious topic that has created much intellectual debate among economists, policy-makers and practitioners. Two main schools of thought exist:

- **Social rate of time preference:** This approach approximates a social **discount** rate based on the aggregate willingness of individuals in society to postpone current consumption in exchange for additional future consumption or vice-versa. The social rate of time preference is fundamentally different from the individual rate of time preference and is often lower because:
 - public investment risk is usually reduced by spreading it among all individuals in society
 - the substitution effect between postponing current consumption for saving is influenced by an individual's finite lifespan, whereas society is assumed to have an infinite lifespan.
- **Social opportunity cost of capital:** A number of models calculate the social opportunity cost of capital, but in principal they reflect the weighted average of pre-tax and post-tax rates of return (i.e. private sector foregone rates of return), with adjustments for public subsidies and exchange rates if foreign funding is used. A related approach called the "*marginal cost of funds*" method treats within-generation and between-generation benefits with different tax adjustments and emphasizes the impact on the government deficit of raising public funds.

The social **discount** rate derived using this approach is often higher than the one that uses the time preference approach. Some scholars argue that the social opportunity cost of capital approach is the preferred method because it does not transfer wealth from the present generation to future generations at a greater cost than is necessary, and it does not leave future generations worse off than they would be without the project.

Box 19 provides detail about how social discount rates are estimated in the United States of America, the United Kingdom and Canada.

Box 19: Approach in the United States, United Kingdom and Canada

Approach in the United States of America

Three federal agencies in the United States of America, including the Congressional Budget Office, the Government Accountability Office and the Office of Management and Budget have routinely used CBA to evaluate infrastructure and other long-term, large-scale federal investments.

The Congressional Budget Office recommends a **discount** rate around 2% based on its estimate of the federal government's long-term cost of borrowing.⁸³ Its theoretical foundation is primarily a social rate of time preference.

The Government Accountability Office favours the nominal **yield** on Treasury debt with a maturity matching the project length, less the forecast rate of inflation and other technical adjustments.⁸⁴ The Office of Management and Budget (OMB) instructs using a **discount** rate close to the "*marginal pre-tax rate of return on an average investment in the private sector in recent years.*"⁸⁵ Both of these policies are theoretically closer to the social opportunity cost of capital approach. The OMB further stipulates the **real discount** rate based on different horizons:

Horizon (year)	3	5	7	10	20	30 and longer
Real discount rate %	0.0	0.4	0.7	1.1	1.7	2.0

Approach in the United Kingdom

The United Kingdom's approach is largely based on the social time preference, with HM Treasury recommending to use a **real social discount** rate of 3.5%, which declines over very long time periods according to the following schedule:

Horizon (year)	0-30	31-75	76-125	126-200	201-300	301+
Real discount rate %	3.5	3.0	2.5	2.0	1.5	1.0

Approach in Canada

The Treasury Board of Canada Secretariat supports a theoretical foundation that combines both the social time preference and social opportunity cost of capital approaches to give a **real social discount** rate of 8%. Similar to the approach adapted by the United States Congressional Budget Office, Canada does not advocate declining **discount** rates for intergenerational projects and prefers the same **discount** rate to be applied to all costs and benefits in a project's CBA.⁸⁶

As illustrated above, different countries, and even different agencies within the same country, have adapted varying theoretical approaches and implemented different practices for deriving an appropriate **discount** rate for infrastructure projects. However, the conceptual and mathematical complexity of choosing a **discount** rate should not deter governments from using CBA to prioritize **strategic infrastructure** projects. The key points to remember when choosing an appropriate **discount** rate are:

- consistency is vital, in concept and in practice. Regardless of which theoretical approach or calculation method is adapted, it must be used to analyse all of the candidate projects being prioritized
- most scholars and practitioners have concluded that a **real social discount** rate between 2%-8% is typically appropriate in most circumstances
- a lower social **discount** rate generally emphasizes the benefits (and costs) future generations will receive, while a higher social **discount** rate stresses the benefits and costs to the current generation
- there is no consensus on whether to use different **discount** rates for intergenerational and intra-generational projects. Nonetheless, a constant **discount** rate simplifies calculations and still provides an acceptable accuracy.

Appendix 7

Risk Analysis



The following Appendix is copied from Appendix A.8 of the World Economic Forum report, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010.

Any discussion of infrastructure and private finance will include reference to risk and whether the proposal presents a manageable risk profile for the provider of private finance.

There is a Need to Distinguish Between Risks and Uncertainties

In essence, “*risk*” usually refers to the obstacles to achieving the forecasted return from investment or debt repayment, although there is also a need to consider those risks that might remain with the public-sector party. But to talk just about risk is probably oversimplistic; instead, consideration should be given to identifying both the risks and the uncertainties for a given proposition. There are no precise definitions for these two factors, but for the purposes of this report we will use the following:

- the term “*risks*” will apply to events that have a measurable probability
- the term “*uncertainties*” will apply to events that are indefinite.

To illustrate the difference between risk and uncertainty, Figure 48 shows a possible list of factors that might fall into the risk category and those that might go in the uncertainty category. In the table, the split between risk and uncertainty has been expanded to differentiate between the impact of an event that is variable, where the impact could be positive or negative and vary over time, and the impact that is simply binary – where it either happens or not. In the case of binary events, we have assumed that the impact is negative.

Figure 48: Impact of Various Risks and Uncertainties

Factor	Risk		Uncertainty	
	Variable impact: impact can be positive or negative and can change over time	Binary impact: impact happens or it does not. Assumes impact is negative	Variable impact: impact can be positive or negative and can change over time	Binary impact: impact happens or it does not. Assumes impact is negative
Technical	<ul style="list-style-type: none"> Capital costs differ from those forecast Operational costs, including maintenance, differ from those forecast Price of inputs – e.g. feedstock 	<ul style="list-style-type: none"> Contract effectiveness (the private-sector party is not left with any it thought had been passed on to another party) Construction completion is late 	<ul style="list-style-type: none"> Technology performs differently from the way it was forecast 	<ul style="list-style-type: none"> Technology does not work as expected
Markets	<ul style="list-style-type: none"> Revenue risk if linked to performance 		<ul style="list-style-type: none"> Revenue risk if linked to demand 	<ul style="list-style-type: none"> Force majeure
Performance obligations under the contract		<ul style="list-style-type: none"> Failure to achieve required operational performance 		
Financial / Economic	<ul style="list-style-type: none"> Cost of debt Exchange rate Interest rate Debt margin (either bank or capital markets) Inflation / deflation Cost of insurance 		<ul style="list-style-type: none"> Availability of debt 	<ul style="list-style-type: none"> Market failure Unavailability of insurance
Political consequences			<ul style="list-style-type: none"> Political interference 	<ul style="list-style-type: none"> Change of law, either general or specific to sector Legal and regulatory enforcement Expropriation Political interference Currency convertability
Other			<ul style="list-style-type: none"> Procurement process <ul style="list-style-type: none"> duration competition 	<ul style="list-style-type: none"> Counterparty failure Land acquisition Climate change - e.g. flooding

An Estimate of the Cost of Each Risk Should be Made

The focus on risk underpins the financial analysis of a project or opportunity because each risk should be allocated a theoretical cost. In reality, however, this cost is likely to be a range of estimates rather than a point estimate. The simple calculation is shown in the following equation:

$$\text{Expected cost of risk} = \text{probability of risk occurring} \times \text{cost if risk occurs}$$

It is this calculation of the expected cost of risk that makes the discrimination between risk and uncertainty important: it is easier to put a price on risk while it can be very difficult, if not impossible, to put a price on uncertainty.

Minimizing the Expected Cost of Risk is Critical to Achieving Value for Money

If the private-sector party is thinking about risk, uncertainties, and their associated costs, then so must the public sector party. This is because the “price” that the private sector attaches to taking on a particular risk or uncertainty will feed into any value-for-money analysis or comparison of public or private finance. No party can totally eliminate all of the risks and uncertainties. The question is how best to reduce the likelihood of the risk of a particular adverse event occurring and how best to reduce the financial impact if it does occur by addressing the following questions:

- Who is best placed to reduce or mitigate the probability of the event occurring?
- Who is best placed to manage the costs of the event if it does occur?

As many of the uncertain events concern the macro socio-economic environment, they will most likely sit with the public sector. Key issues go beyond their cost to more fundamental questions about whether the private sector wishes to invest in that environment. For example, if potential investors think that political interference is likely, then they may look to invest elsewhere.

Reducing the Probability of the Event Occurring

The question “*Who is best placed to reduce the probability of the event occurring?*” should be asked for every aspect of the transaction and should go beyond the headline event. For example, it is likely that the private-sector party is best placed to take the responsibility for the design and construction of any new infrastructure. However, if the infrastructure is being renovated or upgraded, it may be that the public sector is better placed to take the responsibility for the condition of the existing infrastructure, unless the public-sector parties are able to provide extensive information or allow surveys that can be used to establish its current condition.

Managing the Event

The second leg of the risk equation is “*Who is best placed to manage the costs of the event if it does occur?*” In many instances, this will be the same party that is best able to reduce the probability of the risk occurring, but there will be instances where these parties differ. Such circumstances may lead to the conclusion that it is better for the contract parties to share a risk. For example, the occurrence of “*force majeure*” events—such as fire, flood, sonic boom, or volcanic ash cloud—are beyond the control of the private sector, but private-sector players may be able to adjust their operating service to minimize the impact of these events, in terms of both cost and time, on the infrastructure. So, in this instance, the two parties may wish to share the risk.

When considering both parts of the risk equation, consideration needs to be given to how to mitigate the risk. Some of the options, among others, that might exist include:

- **Contractual option:** Once the allocation of risks has been worked through, the contract must be clear on the respective responsibilities of all parties to ensure that there are no “*orphan*” risks. This can be an issue not only in the terms of the contract between the public and private parties but also with the private parties’ sub-contract arrangements. Often, in order to support the allocation of risks, the parties will seek additional guarantees or warranties to back up their obligations. Such guarantees may take the form of supporting the performance of the party and/or giving financial backing should that performance fall short of what is required.
- **Financial option:** The lenders are likely to put conditions on their finance contracts to try to mitigate certain risks. For example, if there is a construction phase, the lender might retain a small percentage of the borrowings to create a small reserve of funds to be released only on the completion of the work. Alternatively, the lender may embed reserve-account mechanisms in the finance documents to deal with variable costs – for example, to deal with major maintenance matters over the life of the asset.
- **Insurance option:** In many instances, risks can be insured against. The main decisions to be made are then whether the insurance represents good value for money or if the party prefers to self-insure; who takes the risk on the premiums changing over time; and who takes the risk on the availability of insurance over time. For example, in the United Kingdom, at times it has been very difficult to insure schools because of the high risk of arson. Also major terrorism events can affect the cost and terms of insurance.
- **Portfolio option:** Whether the risk sits with the public or private sector, consideration should be given to the extent to which individual project/opportunity risks can be mitigated, or possibly accentuated, by a portfolio effect. For example, an equity investor with a global portfolio may be willing to take a degree of political risk with one investment if that risk does not sit with its other investments, because looking at the risk on a portfolio rather than on an individual investment basis lessens the potential impact of the threat. The challenge will, of course, become more of an issue as the predicted risk will mean more specialist investors who may find they have more systemic risk in their portfolios.....

Assessing risk is at the heart of any business, and in this respect infrastructure is no different. Where infrastructure probably differs from mainstream corporate activities is, first, in its reliance on the performance of a single asset to deliver a profit; this creates a need to understand in detail the challenges to achieving the required performance. Second, much infrastructure involves a relationship between public and private parties, whether this relationship is established through partnerships, concessions, regulations, or users.

Investors and lenders will spend much time considering the risks they will accept, based on historical performance, specialist advice, and so on. But they will always struggle to accept some particular events that may be regarded as uncertainties and beyond their ability to control or manage in any way. Given this, it is likely that the public sector, rather than the private one, will need to “*own*” and manage many of these uncertainties.

Appendix 8

Guidelines for Preparing a Finalized Infrastructure Plan and Example of Infrastructure Vision in United Kingdom



Case Study: Economic infrastructure Vision for the United Kingdom

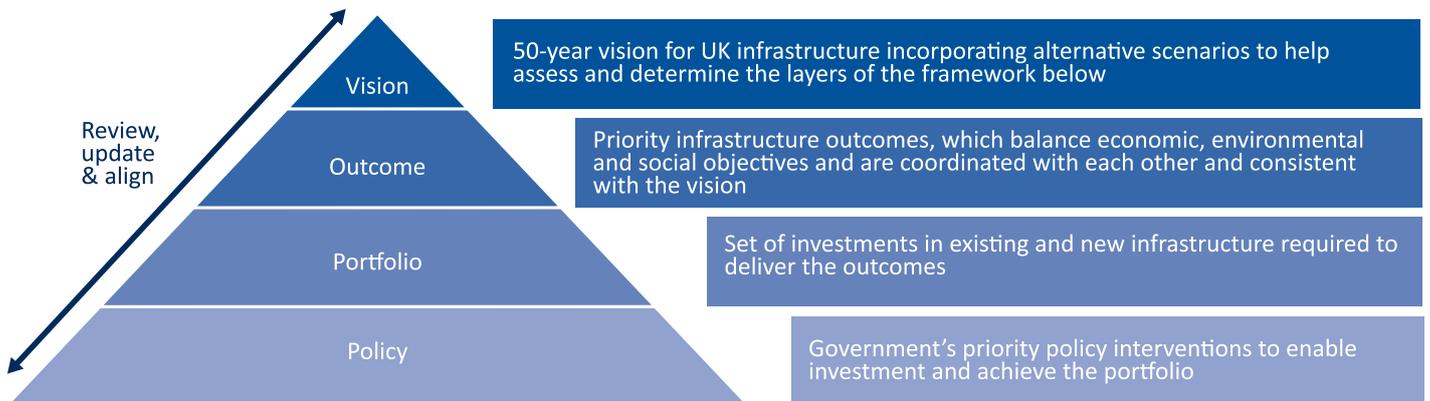
“ The government’s vision for major infrastructure investment in the UK:

- maximizing the potential of existing road and rail networks
- transforming energy and transport systems to deliver a low-carbon economy
- transforming the United Kingdom’s strategic rail infrastructure
- meeting future challenges in providing sustainable access to water for everyone
- protecting the economy from the current and growing risk of floods and coastal erosion
- reducing waste and improving the way it is treated
- providing the best superfast broadband in Europe
- ensuring that the United Kingdom remains a world leader in science, research and innovation. ”

Source: HM Treasury. *National Infrastructure Plan 2010*. October, 2010. p. 5.

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Figure 49: The United Kingdom’s Process to Prepare an Economic Infrastructure Plan



Source: HM Treasury. *Strategy for National Infrastructure*. March, 2010. p. 26.

Figure 50: Infrastructure Australia's Reform and Investment Framework

Description	Components Required	Rationale
<p>1. Goal Definition</p> <p>Definition of the fundamental economic, environmental and social goals that Australia seeks to achieve. For example:</p> <ul style="list-style-type: none"> - Sustained economic growth and increased productivity - Lower carbon emissions and pollution - Greater social amenity and improved quality of life 	<ul style="list-style-type: none"> - Formalized, comprehensive and agreed goals, objectives, targets and indicators - Specific and quantified goals, objectives and targets - Outline how the initiative fits within existing infrastructure plans - Outline of how the goals and objectives align with those of other parties (e.g. National – including Infrastructure Australia's Strategic Priorities, State/Territory, Regional and Local level) and across sectors 	<p>Goals are needed against which problems and solutions can be assessed.</p>
<p>2. Problem Identification</p> <p>Objective, specific, evidence-based and data-rich identification of problems of infrastructure systems and networks that may hinder the achievement of those economic, environmental and social goals.</p>	<ul style="list-style-type: none"> - Situation Assessment – a review and analysis of the current status - Scenario Assessment – a review and analysis of the future status that identifies: <ul style="list-style-type: none"> > Drivers and trends of the current and future situation > Base-case using the current trends (certainties) > Alternative futures using future trends (uncertainties) - A list of Problem Statements that can be accurately defined and quantified 	<p>Specificity regarding inadequacies is essential in order to take targeted and therefore more effective action.</p>
<p>3. Problem Assessment</p> <p>Objective and quantified appraisal of the economic, environmental and social costs of those deficiencies so that the most damaging deficiencies can be identified and prioritized.</p>	<ul style="list-style-type: none"> - Accurate and objective assessment of the economic/ environmental/ social impacts of those problems. - Priorities identified which reflect the scale of impacts 	<p>Understanding the costs/ impacts of deficiencies allows the worst problems to be identified and prioritized.</p>
<p>4. Problem Analysis</p> <p>Objective policy and economic analysis of why these deficiencies exist – i.e. what is the underlying cause (depending on the sector reasons could include market failure, government failure, capital restrictions, etc). This should include an assessment of non-infrastructure reasons for the problem – e.g. land use patterns, peak demand or education/business hours.</p>	<ul style="list-style-type: none"> - For each deficiency, analysis of why those problems have developed - Covers both immediate and underlying causes (e.g. not just “<i>lack of investment</i>”, but causes of underinvestment, e.g. regulatory environment). 	<p>Understanding the causes allows effective and targeted solutions to be created. Infrastructure is often not the only cause of problems.</p>
<p>5. Option Generation</p> <p>Development of a full range of interventions that address the issue in the domains of:</p> <ul style="list-style-type: none"> - Reform (regulation, legislation, governance) - Investment 	<p>Identify the full range of Options for each problem from the domains of:</p> <ul style="list-style-type: none"> - Reform – e.g. independent pricing, regulation, approvals and coordination - Investment – e.g. better use through demand management and capacity increases 	<p>Identification of a broad range of options – across reform and investment areas – rather than relying on early judgements or pre-conceived ideas – is more likely to identify the best Solution or package of Solutions.</p>
<p>6. Option Assessment</p> <p>Strategic analysis and cost benefit analysis to assess those options. The appraisal should incorporate the full range of economic, environmental and social impacts (including agglomeration and trade impacts, carbon impacts, noise, and social amenity) so that the impact on all goals is measured and understood</p>	<p>Qualitative and quantitative analysis including:</p> <ul style="list-style-type: none"> - Strategic analysis – using high-level profiling assessments – to assist in the analysis of a large number of Options; and - Rapid analysis – using a high-level appraisal assessment – such as a Rapid Cost Benefit Analysis (CBA) – to assist in the analysis of a smaller of Options. 	<p>An understanding of the strategic and economic value along with the risks and uncertainties in delivery is essential to understand how the Options or package of Options will achieve the fundamental goals outlined in Stage 1.</p>
<p>7. Solution Prioritisation</p> <p>Identification of policy and investment priorities from the list of solutions on an objective basis that gives primacy to the Benefit/Cost Ratio (BCR) of initiatives, but is balanced by considerations such as strategic fit and deliverability (including risks and affordability)</p>	<ul style="list-style-type: none"> - A structured and objective evaluation framework - that reflects the primacy of CBA along side of the strategic value and deliverability risk - is used to make decisions on the long term infrastructure pipeline. - A review of the Solution is made against the fundamental goals/ problems identification. 	<p>BCRs provide the best available objective evidence as to how well solutions will impact on the goals outlined in Stage 1 – but are not the whole story.</p>

Source: Australian Government, Infrastructure Australia. *A Report to the Council of Australian Governments*. December, 2008. p. 10

Appendix 9

Example of How Government Budgeting Cycles can Impact on Choice of Projects

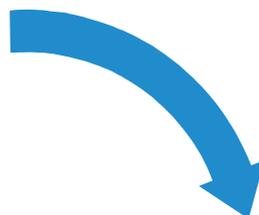
Scenario 1: Yearly Budget Approvals With US\$ 5 Billion Allocated to Each Ministry

	Benefit/ Cost ratio	Upfront cost (US\$ bn)	Government budgets (US\$ bn)	
			Year 1	Year 2
Ministry A			5.0	5.0
Project (A1)	2.00	4.0	-4.0	
Project (A2)	3.00	6.0		
Project (A3)	1.50	1.5		-1.5
Project (A4)	1.50	2.0		-2.0
Total spend			-4.0	-3.5
Cumulative surplus kept			0.0	0.0

	Benefit/ Cost ratio	Upfront cost (US\$ bn)	Government budgets (US\$ bn)	
			Year 1	Year 2
Ministry B			5.0	5.0
Project (B1)	1.10	1.0		-1.0
Project (B2)	1.05	1.0		
Project (B3)	1.25	3.0	-3.0	
Project (B4)	1.20	3.0		-3.0
Project (B5)	1.10	1.0		-1.0
Project (B6)	1.30	7.0		
Project (B7)	1.20	2.0	-2.0	
Total spend			-5.0	-5.0
Cumulative surplus kept			0.0	0.0

Scenario 3: Two-year Budget of US\$ 10 Billion Per Year Allocated to the Best Projects

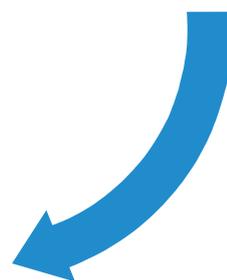
	Benefit/ Cost ratio	Upfront cost (US\$ bn)	Government budgets (US\$ bn)	
			Year 1	Year 2
Ministry A				
Project (A1)	2.00	4.0	-4.0	
Project (A2)	3.00	6.0	-6.0	
Project (A3)	1.50	1.5		1.5
Project (A4)	1.50	2.0		2.0
Ministry B				
Project (B1)	1.10	1.0		
Project (B2)	1.05	1.0		
Project (B3)	1.25	3.0		3.0
Project (B4)	1.20	3.0		3.0
Project (B5)	1.10	1.0		
Project (B6)	1.30	7.0		
Project (B7)	1.20	2.0		
Total spend			-10.0	-9.5
Cumulative surplus kept			0	0.5



Scenario 2: Two-year Budget of US\$ 5 billion Per Year Allocated to Each Ministry

	Benefit/ Cost ratio	Upfront cost (US\$ bn)	Government budgets (US\$ bn)	
			Year 1	Year 2
Ministry A			5.0	5.0
Project (A1)	2.00	4.0	-4.0	
Project (A2)	3.00	6.0		-6.0
Project (A3)	1.50	1.5		
Project (A4)	1.50	2.0		
Total spend			-4.0	-6.0
Cumulative surplus kept			1.0	0.0

	Benefit/ Cost ratio	Upfront cost (US\$ bn)	Government budgets (US\$ bn)	
			Year 1	Year 2
Ministry B			5.0	5.0
Project (B1)	1.10	1.0		
Project (B2)	1.05	1.0		
Project (B3)	1.25	3.0	-3.0	
Project (B4)	1.20	3.0		
Project (B5)	1.10	1.0		
Project (B6)	1.30	7.0		-7.0
Project (B7)	1.20	2.0		
Total spend			-3.0	-7.0
Cumulative surplus kept			2.0	0.0



Scenario 1 portrays the situation where:

- both Ministry A and Ministry B are allocated US\$ 5 billion at the annual budget round for year 1
- both are told they may be entitled to US\$ 5 billion the following year, but cannot make any spending decisions based on this
- they are told any money that is unspent in any year will be returned to central government
- they should invest in projects with the highest BCR (Appendix 6) they can afford

The result is that neither ministry can afford its best project defined by the highest BCR – Project (A.2) with a BCR of 3.00 and Project (B.6) with a BCR of 1.30.

Scenario 2 shows that if the government changes the budgeting rules so that both ministries are entitled to US\$ 5 billion per year and money left unspent in a year can be carried forward to the following year, both Project (A.2) and Project (B.6) can be built – a much better value for money solution.

Scenario 3 illustrates the further benefits achieved by having longer budgeting cycles and allocating money to projects with the highest BCRs rather than relying on an arbitrary or historical US\$ 5 billion per ministry per year decision. This shows what can be achieved by establishing an infrastructure plan, as the plan does the same – prioritizing projects based on the greatest impact to society.

Appendix 10

Economic Infrastructure Plans in Australia, Mexico, Ontario and the United Kingdom

Figure 51: Comparison of Infrastructure Plans in Different Countries

	Australian Infrastructure Plan	Mexico Infrastructure Plan	Ontario (Canada) Infrastructure Plan	United Kingdom Infrastructure Plan
Planning Unit	Infrastructure Australia	Office of the President – Infrastructure Commission	Ministry of Infrastructure	Infrastructure UK, a division in HM Treasury
Formed	2008	2006	2003	2010
Planning cycle	Few years	6 years (following election cycle)	1st plan 5 years, 2nd plan 10 years that has more detail for first 3 years	90% of projects done by 2020 (9 years from 2011 Plan), with 50% over the first 4 years
Progress reports	Yearly	Internal reports, but no external reports	Internal	Yearly
Role	<ul style="list-style-type: none"> – Evaluate and prioritize AUS\$ 100 million+ infrastructure proposals for central government funding – Provide policy advice and guidance, e.g. encouraging the harmonization of regulations across 8 States and Territories – Support States and Territories with issues – Create a National Infrastructure Asset Register – Assist the development of infrastructure plans for remote indigenous communities 	<ul style="list-style-type: none"> – Identify existing projects under consideration and add other projects suggested by the National Construction Industry Chamber to the list – Validate projects with the different government departments and States – Prioritize the projects – Follow up on the progress in delivering the most important projects 	<ul style="list-style-type: none"> – <i>“The intent of the Plan is not to list all infrastructure projects that will proceed over the next 10 years, but rather to set out a strategic framework to guide future investments.”</i> – Create an asset registry of Ontario’s infrastructure <ul style="list-style-type: none"> – asset renewal plans are a prerequisite before considering new infrastructure – Prepare standardized procurement approaches and guidelines for prioritizing infrastructure 	<ul style="list-style-type: none"> – Assist the planning and prioritization of infrastructure (both public and privately owned) and ensure government expenditures are correctly budgeted – Lead reviews and recommend policy changes, e.g. 13-week maximum for the majority of non-planning consents, or opportunities to maximize use of infrastructure assets – Help to deliver PPPs and build a stronger public-sector delivery capacity – Collate performance metrics and asset registers – Oversee government departments and ensure policy changes occur
Stakeholder involvement	<ul style="list-style-type: none"> – Seems limited – Prioritization decided at the State, Territory and local level 	<ul style="list-style-type: none"> – Seems limited – Decisions made within central and local government departments 	<ul style="list-style-type: none"> – Some wider involvement but most project ideas formulated within different government departments – During the implementation phase, the government tries to <i>“manage the market”</i>, drip-feeding the project tenders to avoid too many projects being procured at the same time, and has quarterly meetings with the construction sector 	<ul style="list-style-type: none"> – Seems limited

Figure 51: Comparison of Infrastructure Plans in Different Countries (continued)

	Australian Infrastructure Plan	Mexico Infrastructure Plan	Ontario (Canada) Infrastructure Plan	UK Infrastructure Plan
Size of the Unit	Small, about 10 professional staff	Small, about 7 professional staff at start, now less	Unclear, but 20+ senior staff in the ministry	Small, about 10 professional staff
Sectors				
– Economic infrastructure*	●	●	●	●
– Energy distribution/transmission	●	●	○	●
– Energy generation	●	●	○	●
– Social Infrastructure	○	○	●	○
– Soft infrastructure	○	○	○	○
– Other?	○	○	○	● Intellectual capital
Taxpayer-funded infrastructure	●	●	●	●
User-funded infrastructure	●	●	○	●
Evaluation metrics				
– Financial	●	●	●	●
– Environment	●	●	●	●
– Social	●	●	●	●
Results from prioritization clear	– Yes, clear BCRs	– No, but plan states “projects must have undergone the corresponding technical, economic and environmental feasibility studies”	Limited, and does not appear to be clear value for money assessment. For example many PPP projects have significant completion payments up to 65% of the capital cost, reducing the incentives for high-level service standards.	– No, 500 projects identified, with 40 priority projects, but no clear evidence of rationale. Some timelines are also unclear, although approximately 50% of the expenditure is planned for 2012-2015 – Future plan updates to provide additional detail
Implementation	– At National, State/Territory and local levels	– At National and State levels, with each Minister or State entity responsible for the implementation	– Infrastructure Ontario manages and in some cases helps finance projects using a PPP approach or borrowing money on the municipalities’ behalf – Provides project delivery, real estate management and asset planning expertise	– 57% to be owned and funded privately – For public-sector projects implemented at the departmental and municipal levels

Key

* Economic infrastructure excluding energy generation, transmission and distribution
 ● Yes ● Partly ○ No

Sources:

Australian Government, Infrastructure Australia. *A Report to the Council of Australian Governments*. December, 2008.
 Australian Government, Infrastructure Australia. *Communicating the Imperative for Action: A Report to the Council of Australian Government*. June, 2011.
 Government of Mexico, 2007-2012 *National Infrastructure Program*. 2007.
 HM Treasury. *National Infrastructure Plan 2010*. October, 2010.
 HM Treasury. *National Infrastructure Plan 2011*. November, 2011.
 Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011.
 White and Case, *Client Alert: Updated Mexican Public Infrastructure Projects, 2011*. February 2011.

Appendix 11

Definition of Different Public-Private Partnership Contracting Modes



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This Appendix is drawn from material on the World Bank's Public-Private Partnership (PPP) in Infrastructure Resource Centre for Contracts Laws and Regulation available at www.worldbank.org/ppp. Figure 20 from Section B.1 is replicated for guidance.

Management and Operating Contracts

Management contracts and Operating and Maintenance (O&M) contracts are contracts governing a type of public-private partnership agreement. This section explains key features of this type of arrangement, provides sample contracts, bidding documents and checklists.

What Are “Management” and “Operation and Maintenance” Contracts?

The term “**management contract**” has been applied to cover a range of contracts from technical assistance contracts through to full-blown operation and maintenance agreements and so it is difficult to generalize about them. The main common features are that the awarding authority engages the contractor to manage a range of activities for a relatively short time period (two to five years). **Management contracts** tend to be task-specific and input- rather than output-focused. Operation and maintenance agreements may have more outputs or performance requirements.

The simplest **management contracts** involve the private operator being paid a fixed fee by the awarding authority for performing specific tasks – the remuneration does not depend on collection of tariffs and the private operator does not typically take on the risk of asset condition. Where the **management contracts** become more performance-based, they may involve the operator taking on more risk, even risk of asset condition and replacement of more minor components and equipment.

Key Features of Management/O&M Agreements

- Contractor to manage a range of activities
- Generally short term, usually for two to five years
- Traditionally been favoured as transitional arrangements for introducing the private sector into managing infrastructure but longer-term operation and maintenance agreements are becoming more common in the water and energy sectors where more extensive participation by the private sector through a lease, **affermage** or **concession** arrangement in these “*essential services*” is deemed to be too politically sensitive or impractical
- Commonly found in the water sector and, to a more limited extent, energy sector
- Limited potential for improvements in efficiency and performance although more sophisticated management contracts (which are often called operation and **maintenance contracts**) may introduce some incentives for efficiency or improved bill collection, by defining performance targets and basing a portion of the remuneration on their fulfilment (and cover longer time periods)
- Operator is usually paid a fixed fee to cover its staff and expenses. There may also be a performance-based fee and liquidated damages for failure to achieve performance parameters
- Operator may be required to collect bills on behalf of the utility and may accept some collection risk in terms of performance standards but is unlikely to collect bills on its own behalf
- Can be useful where condition of assets is uncertain where the private sector would be unwilling to accept more extensive risk
- Some may also include obligations on the private operator to operate and maintain the assets, sometimes extending to bearing the cost of routine replacement of small, low-value parts of equipment. Such features require more monitoring to ensure that the outputs are being achieved and usually involve higher establishment costs
- Operating agreements are also usual in relation to BOT/**concession** arrangements, with the concessionaire subcontracting the operations phase of the **concession** to an operator
- Usually no transfer of employees to the contractor – the contractor will merely add a layer of management over the existing utility structure. This often causes problems if the staff of the utility still look to the awarding authority, their employer, for instructions. Enforcement of discipline by the private operator may also be difficult.

Figure 20: Types of Public-Private Partnership Agreement and Typical Sources of Finance

Public sector owns and operates assets		Public-Private Partnerships				Private sector owns and operates assets
<ul style="list-style-type: none"> – Utility restructuring – Corporatization – Decentralization 	<ul style="list-style-type: none"> – Civil works – Service contracts 	<ul style="list-style-type: none"> – Management and operating contracts 	<ul style="list-style-type: none"> – Leases/affermage 	<ul style="list-style-type: none"> – Concessions – BOT Projects – DBOs 	<ul style="list-style-type: none"> – Joint Venture – Partial divestiture of public assets 	<ul style="list-style-type: none"> – Full divestiture
Public finance				Mix of public and private finance		All private finance
Low		Extent of Private Sector Participation				High

Key : BOT – Build-Operate-Transfer DBO – Design-Build-Operate

Source: Based on World Bank's PPP in Infrastructure Resource Centre definition - <http://ppp.worldbank.org/public-private-partnership/agreements>

Leases and Affermage Contracts

Leases and **affermage** contracts are generally public-private sector arrangements under which the private operator is responsible for operating and maintaining the utility but not for financing the investment.

When to Choose Leases/Affermage Contracts

- when private equity and commercial debt are not available for water supply and sanitation
- the awarding authority wants to combine public financing with attracting private efficiency; and
- greater commercial risk is to be passed to the private operator than with a **management contract**, with incentives to perform.

Leases and Affermages differ from management contracts principally in that:

- the operator does not receive a fixed fee for his services from the awarding authority but charges an operator fee to consumers, with:
 - in the case of a **lease** a portion of the receipts going to the awarding authority as owner of the assets as a **lease** fee and the remainder being retained by the operator
 - in the case of an **affermage**, the operator retaining the operator fee out of the receipts ("*prix du fermier*") and paying an additional surcharge that is charged to customers to the awarding authority to go towards investments that the awarding authority makes/has made in the infrastructure
- the operator tends to bear greater operating risk
- the operator tends to employ the staff directly.

In the case of a **lease** the rental payment to the authority tends to be fixed irrespective of the level of tariff collection that is achieved and so the operator takes a risk on bill collection and on receipts covering its operating costs. In the case of **affermage** the operator is assured of its fee (assuming that the receipts are sufficient to cover it) and it is the authority that takes the risk on the rest of the receipts collected from customers covering its investment commitments.

The awarding authority in each case remains responsible for financing and managing investment in the assets – which is supposed to come, at least in part, from the rental payment/surcharge. Some **affermage** arrangements the operator designs and manages the investment programme.

In France and some other civil law countries the key provisions establishing the **affermage** are set out in the law and so a typical French **affermage** contract will be relatively short in comparison to an equivalent document in a common law jurisdiction.

Key Features of Leases and Affermage Contracts

- Medium length – typically between eight and 15 years
- Collection risk passed to operator in lease
- **Lease** operator will require assurances as to tariff levels and increases over term of **lease**, and compensation/review mechanism if tariff levels do not meet projections
- Cost of maintenance and some replacement passed to operator (operator takes some degree of asset risk in terms of the performance of the assets)
- Operator may be put in charge of overseeing capital investment programme/specific capital works;
- Employer is paid a fixed **lease** fee (**lease**)/receives net receipts from customers (less **affermage** fee) (**affermage**)
- Review process every four or five years to review performance, costs, tariff levels, etc.
- Employees seconded or transferred to the operator
- Operator to maintain asset register and operation and maintenance manuals/ records, etc.
- Typical to include minimum maintenance or replacement provisions towards the end of the contract, so that facilities are handed back in an operational state.

Concessions, Build-Operate-Transfer (BOT) and Design-Build-Operate (DBO) Projects

Concessions, Build-Operate-Transfer (BOT) Projects, and Design-Build-Operate (DBO) Projects are a type of **public-private partnership**. See below for definitions of each type of agreement, as well as key features and examples of each. This page also includes links to checklists, toolkits and sector-specific PPP information.

Overview of Concessions, BOTs, DBO Projects

A **concession** gives an operator the long-term right to use all utility assets conferred on the operator, including responsibility for all operation and investment. Asset ownership remains with the authority. Assets revert to the authority at the end of the **concession** period, including assets purchased by the operator. In a **concession** the operator typically obtains its revenues directly from the consumer and so it has a direct relationship with the consumer. A **concession** covers an entire infrastructure system (so may include the operator taking over existing assets as well as building and operating new assets).

A **BOT Project (Build-Operate-Transfer project)** is typically used to develop a discrete asset rather than a whole network and is generally entirely new or **greenfield** in nature (although refurbishment may be involved). In a **BOT Project** the project company or operator generally obtains its revenues through a fee charged to the utility/ government rather than tariffs charged to consumers. A number of projects are called **concessions**, such as toll road projects, which are new build and have a number of similarities to BOTs.

In a **Design-Build-Operate** project the public sector owns and finances the construction of new assets. The private sector designs, builds and operates the assets to meet certain agreed outputs. The documentation for a DBO is typically simpler than a BOT or Concession as there are no financing documents and will typically consist of a civil works contract plus an operating contract, or a section added to the contract covering operations. The Operator is taking no financing risk and will typically be paid a sum for the design-build of the plant and then an operating fee for the operating period.

Key Features

Concessions

- A **concession** gives a private operator responsibility not only for operation and maintenance of the assets but also for financing and managing all required investment.
- The operator takes risk for the condition of the assets and for investment.
- A **concession** may be granted in relation to existing assets, an existing utility, or for extensive rehabilitation and extension of an existing asset (although often new build projects are called **concessions**).
- A **concession** is typically for a period of 25 to 30 years (i.e., long enough at least to fully amortize major initial investments).
- Asset ownership typically rests with the awarding authority and all rights in respect to those assets revert to the awarding authority at the end of the **concession**.
- General public is usually the customer and source of revenue for the operator.
- Often the operator will be operating the existing assets from the outset of the **concession** – and so there will be immediate cash flow available to pay operator, set aside for investment, service debt, etc.
- Unlike most **management contracts**, **concessions** are focused on outputs – i.e. the delivery of a service in accordance with performance standards. There is less focus on inputs – i.e. the service provider is left to determine how to achieve agreed performance standards, although there may be some requirements regarding frequency of asset renewal and consultation with the awarding authority or regulator on such key features as maintenance and renewal of assets, increase in capacity and asset replacement towards the end of the **concession** term.
- Some infrastructure services are deemed to be essential, and some are monopolies. Limits will probably be placed on the operator – by law, through the contract or through regulation – on tariff levels. The operator will need assurances that it will be able to finance its obligations and still maintain a profitable rate of return and so appropriate safeguards will need to be included in the **concession** agreement or in legislation.

- In many countries there are sectors where the total collection of tariffs does not cover the cost of operation of the assets, let alone further investment. In these cases, a clear basis of alternative cost recovery will need be set out in the **concession**, whether from general subsidies, from taxation or from loans from government or other sources.
- The concept of a “**concession**” was first developed in France. As with **affermages**, the framework for the **concession** is set out in the law and the contract contains provisions specific to the project. Emphasis is placed in the law on the public nature of the arrangement (because the operator has a direct relationship with the consumer) and safeguards are enshrined in the law to protect the consumer. Similar legal frameworks have been incorporated into civil law systems elsewhere.
- Under French law the concessionaire has the obligation to provide continuity of services (“*la continuité du service public*”), to treat all consumers equally (“*l’égalité des usagers*”) and to adapt the service according to changing needs (“*l’adaptation du service*”). In return, the concessionaire is protected against new **concessions** which would adversely affect the rights of the concessionaire. It is therefore important when considering **concessions** in civil law systems to understand what rights are already embodied in the law.
- Within the context of common law systems, the closest comparable legal structure is the BOT, which is typically for the purpose of constructing a facility or system.

BOT Projects

- In a BOT project, the public sector grantor grants to a private company the right to develop and operate a facility or system for a certain period (the “**Concession Period**”), in what would traditionally be a public sector project.
- Usually a discrete, **greenfield** new build project.
- Operator finances, owns and constructs the facility or system and operates it commercially for the **concession** period, after which the facility is transferred to the authority.
- BOT is the classic tool for project finance. As it relates to new build, there is no revenue stream from the outset. Lenders are therefore anxious to ensure that project assets are ring-fenced within the operating project company and that all risks associated with the project are assumed and passed on to the appropriate actor. The operator is therefore usually a **special purpose vehicle**.
- The revenues are often obtained from a single “*offtake purchaser*” such as a utility or government, who purchases project output from the project company (this is different from a pure **concession** where output is sold directly to consumers and end-users). In the power sector, this will take the form of a Power Purchase Agreement.
- Project company obtains financing for the project, and procures the design and construction of the works and operates the facility during the **concession** period.
- Project company is a **special purpose vehicle**, its shareholders will often include companies with construction and/or operation experience, and with input supply and offtake purchase capabilities. It is also essential to include shareholders with experience in the management of the appropriate type of projects, such as working with diverse and multicultural partners, given the particular risks specific to these aspects of a BOT project. The offtake purchaser/ utility will be anxious to ensure that the key shareholders remain in the project company for a period of time as the project is likely to have been awarded to it on the basis of their expertise and financial stability.

- Project company will coordinate the construction and operation of the project in accordance with the requirements of the **concession** agreement. The off-taker will want to know the identity of the construction subcontractor and the operator.
- The project company (and the lenders) in a power project will be anxious to ensure it has a secure affordable source of fuel. It will often enter into a bulk supply agreement for fuel, and the supplier may be the same entity as the power purchaser under the Power Purchase Agreement, namely the state power company. Power is also the main operating cost for a water or wastewater treatment plant and so operators will need certainty as to cost and source of power.
- The revenues generated from the operation phase are intended to cover operating costs, maintenance, repayment of debt principal (which represents a significant portion of development and construction costs), financing costs (including interest and fees), and a return for the shareholders of the **special purpose vehicle**.
- Lenders provide non-recourse or limited-recourse financing and will, therefore, bear any residual risk along with the project company and its shareholders.
- The project company is assuming a lot of risk. It is anxious to ensure that those risks that stay with the grantor are protected. It is common for a project company to require some form of guarantee from the government and/ or, particularly in the case of power projects, commitments from the government which are incorporated into an Implementation Agreements.
- In order to minimize such residual risk (as the lenders will only want, as far as possible, to bear a limited portion of the commercial risk of the project) the lenders will insist on passing the project company risk to the other project participants through contracts, such as a construction contract, an operation and maintenance contract.

Joint Ventures/Empresas Mixtas

A mode for public-private infrastructure projects favoured by many countries is the Joint Venture, known in Spanish as “*empresas mixtas*”. This section explores key issues to consider when establishing Joint Ventures, and includes sample legislative frameworks for this kind of entities.

Overview of Public-Private Joint Ventures

- In the case of an existing utility, shares in the utility are divested to the private sector. In the case of a new-build project, the project company will be established with a joint share ownership structure.
- The level of share ownership will differ depending on whether the government is seeking to get the project off balance sheet and whether the government wishes to retain management control of the utility. However, there are ways of giving the government control, or even negative veto power over certain management issues, even though it transfers a majority of the shares in the entity to the private sector.
- For strategic reasons, the public sector will often keep control of the entity (at least initially), particularly if the joint-venture company owns the assets. However, the private sector will want to be sure that it can manage the management of the entity and so will require powers of veto or weighted voting rights on certain issues.
- Typically, the operation and maintenance functions are delegated to the private operator through a **management contract**.
- Rights attaching to shares and the rights between the shareholders are typically set out in the constitutional documents of the company and the shareholders’ agreement.

It is also possible to have a joint venture in the form either of:

- a partnership (arrangement with profit-sharing between partners) created for specific purpose – no separate legal entity created and each of the partners with full legal responsibility for the project; or
- a contractual consortium arrangement in which the parties contract to work together on a specific project. There is here, however, no concept of a sharing of a pool of profits as there is with a partnership. Each party is remunerated for specific services provided to the consortium and no separate legal entity is created.



Appendix 12

Project Finance Markets



This Appendix provides further information on the **project finance** market, which is a very important source of financing for government infrastructure projects. Five main figures are provided that explain the many sources of **project finance**, how different financial assumptions can reduce the price governments need to pay for

infrastructure, the level of returns **primary equity investors** can make if they can commission infrastructure on time and to cost and can then sell the asset to **secondary equity investors**, and information about the ratings that credit agencies attribute to financial products.

Figure 52: Sources of Project Finance

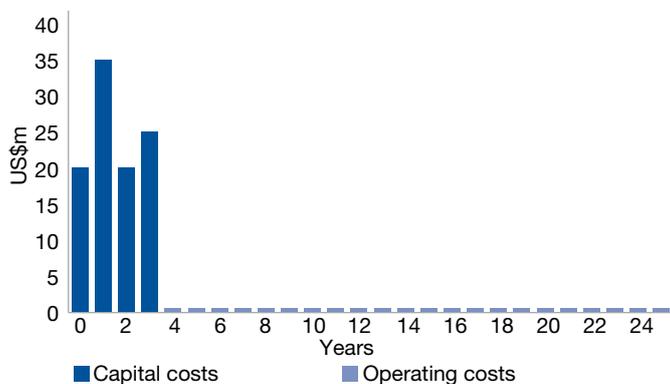
Debt		Equity	
Direct	Project developers and the EPC companies involved in the project may be prepared to loan money to fund, or partly fund, the project.	Direct	Corporate equity is still important, although much of the focus on potential sources of funding is on commercial debt and institutional equity. These direct investments are most common from the construction and operating companies involved in the particular project. Less common is when insurance companies, sovereign wealth funds or pension companies invest directly in a project. In some cases lending banks also invest equity directly into projects.
Commercial bank loans	This is the most common source of debt.	Institutional investments	Much institutional equity has been committed to or invested in infrastructure funds. When funds are being raised, the fund sponsor will describe the planned scope of fund and whether it is focused on a particular sector or geographical area. Funds can be: <ul style="list-style-type: none"> – Listed funds – Some specialist funds are listed on stock exchanges, which creates a more liquid market. This has become a less common investment route since the financial crisis. – Private funds or unlisted funds – Unlisted funds are more common at present as they are cheaper to set up. – Funds sponsored by banks – Banks have had stakes in their own funds with or without third-party investors.
Public capital markets	The bond markets can be used to finance infrastructure investments above about US\$ 150 million. Any less than that and the costs of issuing the bond are often too high. To be sold on public markets, bonds must be rated by at least one of the ratings agencies (see Figure 56). However, during the current financial turbulence, the bond markets for standalone projects have been negatively affected. ⁸⁷		
Municipal bond markets	Although the municipal bond market is not unique to the United States of America, it is most common there. The main difference between standard bonds and municipal bonds is the latter are exempt from federal or state income tax. ⁸⁸		
Private placements	Rather than a bond being launched on the financial markets, a private placement bond is sold to a smaller selected number of investors. They are cheaper to launch and can be tailored more easily to the needs of the few investors. But the terms may not be as competitive as those obtained from standard bonds. For this reason they are more common for investments less than about US\$ 150 million but, like the bond market, the number of private placements has fallen since the crisis.		

Source: Based on World Economic Forum, *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010. Appendices A.1, A.2 and A.3

Implications of Different Capital Structures

To illustrate the effects of different capital structures, the following cost structure is assumed (Figure 53) with a phased construction profile over the first three years and one day (i.e. on the first day of the contract some upfront costs are paid for) and, for simplicity, no operating or maintenance costs for the following 22 years of operations.

Figure 53: Illustrative Capital and Operating Cost Profiles for Project



Five other simplifying assumptions have also been made, notably there are no taxes, the asset is depreciated on a straight line basis over its 22-year operating life and construction costs are paid on the last day of each year (i.e. as the construction period is three years plus one day on the first day upfront costs are paid for, such as the costs of ordering materials). This means debt is drawn down at the end of each period. Lastly, it is assumed that the highest possible gearing ratio is 85%:15% and the debt repayments have not been sculpted.⁸⁹

Figure 54 summarizes the impacts on the annual price that government must pay. In the case of the government guarantee for 50% of the debt, it has been assumed that the cost of government debt is 4% and banks charge a liquidity margin of 1%. This makes the cost of the government guaranteed debt 5%. Therefore, the blended (average) interest rate is 6%, excluding any internal cost to the government of the guarantee as some guaranteed loans experience payment problems.

Figure 54: Illustrative Effects on the Annual Price the Government Must Pay for Different Cost Scenarios

	Debt options			Equity options
	Traditional PPP	PPP with cheaper source of debt	PPP with 50% government guarantee	PPP with cheaper equity
Concession structure				
Concession length (yrs)	25	25	25	25
Construction length (yrs)	3	3	3	3
Operations length (yrs)	22	22	22	22
Investment shares				
% private debt	85%	85%	42.50%	85%
% government guaranteed debt			42.50%	
% equity	15%	15%	15%	15%
Rates of return (%)				
Private debt interest rate	7.0%	6.5%	7.0%	7.0%
Government guaranteed debt interest rate			5.0%	
Equity returns	15.0%	15.0%	15.0%	12.5%
Summary results				
Annual price government pays (US\$ million)	13.8	13.3	12.8	12.9
Total cost over concession (US\$ million)	302.5	291.9	281.8	282.7
% Saving compared to traditional PPP	N/A	3.5%	6.8%	6.5%

Appendix 13

The Challenge of Building and Sustaining Public-Sector Transaction Skills



a) Intelligent Procurement

Intelligent procurement means the ability to design and promote commercially viable propositions or programmes. Projects or programmes that have come to market based on poorly thought out proposals will fail to attract private finance or will attract such a range of responses that it is then difficult to compare and select a winning bid. Such an approach may also create a wider loss of credibility and can taint the programme or project even when it is relaunched.

b) Provision of Best Value for Money

One of the greatest challenges in the procurement process is negotiating transactions that represent good value for money; this is a concern whether infrastructure is being publicly or privately financed. There can often be a perception (one that sometimes reflects reality) that public authorities do not have the necessary business acumen to transact the “best” deal.....

There is not an expectation that all of these skills will be, or even should be, held in-house; rather there is an understanding of the scope of work required by specialist advisers and an ability to interpret their findings as needed.

c) Efficient Decision-making

While there undoubtedly remains a role for governments to appoint specialist advisers, as indicated above, this should not be a substitute for knowledge of the fundamentals (whether technical, legal, or financial) by public servants so that informed decisions can be made. The public authorities should not consider the use of advisers to be a reason to abdicate their decision-making role. Being able to understand the fundamentals also ensures that advisers can be challenged and an educated conclusion – including whether to accept or reject the advisers’ recommendations – can be reached.

d) The Ability to React to Change

A sound understanding of the commercial environment, particularly the financial markets, will help governments react to change faster and more effectively. This is true whether it is a change that occurs during the course of the transaction or in the context of downstream contract revisions. As evidenced in the current economic environment, some public procurers did not know how to react to the turmoil around them.



This Appendix is copied from Chapter 2.2 of the World Economic Forum's *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010 report.

At the heart of any infrastructure transaction is the government – as partner, regulator, grantor of concessions and licences, seller, or investor. Yet despite the importance of the infrastructure sector, building and sustaining the relevant skill set within the government has been a challenge in both developing and emerging markets.

..... we have highlighted some of the consequences of those skill gaps, the environment that can perpetuate them, and how they might be addressed.

Insufficient Commercial Skills can Severely Hinder Infrastructure Procurement

Skill gaps can become an impediment to infrastructure development in four areas:

- intelligent procurement
- provision of best value for money
- efficient decision-making
- the ability to react to change.

Transaction Capacity can be Built Through a Combination of Understanding of Skills Needed, Training, and Dedicated Funding

The following can be effective in addressing skills gaps:

- recognizing what skills are needed for complex transactions
- training staff
- avoiding staff rotation
- providing sufficient funding for public bodies that promote and procure infrastructure.

We address them further below.

a) Recognizing the Skills Needed for Complex Transactions

Private parties will employ specialist and experienced staff and advisers to develop multiple opportunities. Yet for the public counterparty, involved staff may only experience one infrastructure procurement project in their career. Often their responsibility for delivering a project will be an addition to their current workload rather than a separate assignment. As a result, they may become overwhelmed by the volume and complexity of the process.

Recognizing the complexity of transactions and properly resourcing the procurement teams goes a long way towards a successful procurement.

b) Training Staff

Even when proper resources are in place, it is vital that employees have relevant training to fulfil their role. In some instances, this will be specialized training on issues such as public procurement laws. In others, it will be general training about project management, including financial analysis and operational standards.

c) Avoiding Staff Rotation

It is not uncommon for public-sector employees to regularly rotate their posts. Although this can be very beneficial for developing the breadth of the authorities' overall experience, it can severely limit the development of specialist knowledge. Infrastructure projects can be particularly hard hit by this approach because of the time they take to progress: project timelines can easily exceed a rotation. The level of procurement by some public authorities, however, may not merit a specialist team. In such circumstances, the timing of rotations needs to be carefully considered.

d) Providing sufficient funding for public bodies that promote and procure infrastructure

Procurements valued at many million dollars cannot be transacted on a shoestring. Indeed, attempting to transact procurements with minimum upfront costs can prove to be a false economy as it may result in sub-optimal transactions with reduced value for money over the period of the contract.

Some Countries and Regions May Provide a Template for Building Transaction Skills

It is common to set up a national or local unit solely focused on setting policy and promoting and advising on the procurement of PPP projects. Globally there are at least 150 such units.⁹⁰ The majority of these organizations have been set up as government agencies, often within the ministry of finance, but there are a handful of examples where they are PPPs themselves.....

Appendix 14

Acronyms

ADB	Asia Development Bank	OMB	Office of Management and Budgets (United States of America)
BCR	Benefit/cost ratio	PCG	Partial credit guarantee
BoKIR	Body of Knowledge on Infrastructure Regulation (prepared by the World Bank)	PIDA	Program for Infrastructure Development in Africa
BOT	Build-Operate-Transfer	PMBOK	Project Management Institute Body of Knowledge
CAD	Computer aided design	PMI	Project Management Institute
CBA	Cost benefit analysis	PPI	Public Participation in Infrastructure
CCI	Clinton Climate Initiative	PPP	Public-private partnerships
COMESA	Common Market for Eastern and Southern Africa (comprising Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe)	PRINCE2	Projects IN Controlled Environments
CoST	Construction Sector Transparency Initiative	RACI	Responsible, Accountable, Consulted, Informed charts
DBO	Design-Build-Operate	SADC	Southern African Development Community (comprising Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe)
EAC	East African Community, comprising Burundi, Kenya, Rwanda, Tanzania and Uganda	SPV	Special purpose vehicle
ESA 95	European Accounting Standard for European public sector entities		
ECOWAS	Economic Community of West African States (comprising Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo)		
EIB	European Investment Bank		
EPC	Engineering, procurement and construction		
FIDIC	International Federation of Consulting Engineers		
GDP	Gross domestic product		
IFRS	International Financial Reporting Standards		
IPMA	International Project Management Association		
IPSAS	International Public Sector Accounting Standards		
KPI	Key performance indicator		
MDB	Multilateral development bank		
NGO	Non-Governmental Organization		
NEPAD	New Partnership for African Development		
NIMBY	Not In My Back Yard		
ODA	Olympic Development Authority (United Kingdom)		
OECD	Organisation for Economic Co-operation and Development		

Appendix 15

Glossary of Definitions

Affermage: a type of public-private partnership where the private operator is responsible for operating and maintaining the infrastructure (especially a utility such as water supply or sanitation), but not for financing the investment. Unlike a **lease**, the operator is assured of its fee (assuming that the receipts are sufficient to cover it) and the awarding authority takes the risk that the rest of the receipts collected from customers cover its investment commitments.

Benefit/cost ratio (BCR): an indicator, used in the formal discipline of **cost benefit analysis**. The BCR attempts to summarize the overall value for money of a project or proposal. A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs should be expressed in **discounted present values**.

Billion: one thousand (1,000) million.

Brownfield: for the purposes of this Report, **brownfield** investment is where infrastructure assets are already built. Compare to **greenfield** investment.

Build-Operator-Transfer (BOT): a procurement structure typically used to develop a discrete asset rather than a whole network, and is most commonly used for assets that are entirely new or (**greenfield**) in nature (although refurbishment may be involved). In a BOT project the project company or operator generally obtains its revenues through a fee charged to the utility/ government rather than tariffs charged to consumers. The contractor will design, build and operate the asset. At the end of the contract the asset will be returned to the government at a pre-defined condition.

Concession: a contractual approach where a public party, usually the state, gives a third party the right to use land or property for a specific purpose and for a specific period.

Cost benefit analysis (CBA): one methodology used to evaluate projects from a societal perspective, including financial, economic, environmental, and social costs and benefits. The methodology requires converting all costs and benefits into a common monetary base, including the intangible elements that are not commonly measured in monetary units. The common monetary base provides a platform where different candidate projects can be compared and prioritized.

Cost-effectiveness analysis: one methodology used to evaluate projects from a societal perspective, including financial, economic, environmental and social costs and benefits. The primary difference between **cost benefit analysis** and **cost-effectiveness analysis** is that the latter does not convert non-financial benefits and costs into a single monetary unit. Instead, benefits are converted to a non-monetary common unit that can be used to compare projects. This method is especially useful when benefits are difficult to convert into financial terms, e.g. a pleasant view.

Critical infrastructure: infrastructure that is essential to support the socio-economic development of an economy. Examples include flood barriers, power generation and mass transit. Countries at different stages of economic development have different definitions of what is “*too important to fail*”. For example, an electricity supply with very infrequent power outages may be regarded as critical in many developed countries, while many emerging economies deal with such challenges daily.

Discounting: practices of converting cost and benefit values from different time periods to a common time reference point (the “**present value**”) to properly calculate the net benefits.

Design-Build-Operate (DBO): a procurement route where the public sector owns and finances the construction of new assets. The private sector designs, builds and operates the assets to meet certain agreed outputs. The documentation for a DBO is typically simpler than a BOT or **Concession** as there are no financing documents and will typically consist of a civil works contract plus an operating contract, or a section added to the contract covering operations. The Operator is taking no financing risk and will typically be paid a sum for the design-build of the plant and then an operating fee for the operating period.

Do nothing or do minimum approach: a concept used in **cost benefit analysis** that is also known as the **reference case** to understand in greater detail what the economic, social and environmental implications would be if either infrastructure was left to deteriorate or simply if maintenance schedules were adhered to. Creating a **reference case** gives a baseline from which to compare other options.

Economic infrastructure: projects that support economic growth and allow society to function. Examples include transport facilities (air, sea and land), utilities (water, gas and electricity), flood protection, waste management and telecommunications networks.

Engineering, procurement and construction (EPC): a subset of design-build procurement solutions where specifications for suppliers are output- or outcome-based, rather than defining a precise solution. The contractors must spend money preparing designs but the eventual solutions normally represent better value for money than the traditional routes.

Finance: the source of monies to pay upfront for an infrastructure project. Projects can either be financed from existing resources or by borrowing and equity investments. Contrast to **funding**.

Functional infrastructure: infrastructure that works and satisfies the demand. Examples include roads that are rarely congested and electricity grids that can distribute required energy loads.

Funding: in the context of this Report, how infrastructure projects are ultimately paid for, whether from taxpayer receipts, from user charges or a combination of both. Contrast to **finance**.

Future scalability: projects that allow sufficient room for expansion.

Greenfield: for the purposes of this Report where infrastructure assets have yet to be built this is termed **greenfield** investment. Compare to **brownfield** investment.

Gross domestic product (GDP): the market value of all officially recognized final goods and services produced within a country in a year.

Hierarchy of Quick Infrastructure Wins: methodology that encourages planners to initially consider less capital-intensive infrastructure solutions, rather than immediately focusing on a new-build solution as the only option.

Industrial infrastructure: infrastructure that is used by industry, for example, roads within a large factory complex, but this Report would classify this as industrial investment rather than use the term infrastructure.

Infrastructure goals: a mid-term (circa 10-year) image of how **economic infrastructure** in a country should be developed to meet the long-term **infrastructure vision**. The goals should be outcome-based, e.g. 20% less congestion.

Infrastructure vision: a long-term (circa 50-year) image of what the economic infrastructure in a country should look like.

Input-output analysis: a methodology for evaluating the economic, social and environmental benefits of projects using the complex network of **interdependencies** between different economic sectors. This analysis requires establishing an **input-output** accounting matrix, often already available from national or regional **gross domestic product** accounts. Using the input-output matrix and resultant economic multipliers, the economic impacts of candidate projects can be considered.

Interdependencies: the spatial relationships with other infrastructure projects. For example, a new airport will require roads and power to be successful.

Lease: in the context of this report, a type of **public-private partnership** where the private operator is responsible for operating and maintaining the infrastructure (especially a utility, such as water supply or sanitation), but not for financing the investment. The rental payment to the authority tends to be fixed irrespective of the level of tariff collection that is achieved, such that the operator takes a risk on bill collection and on receipts covering its operating costs.

Management contract: an agreement where all maintenance services are put out to tender. **Management contracts** generally run from two to five years, but can be to seven years, and give the contractor the ability to manage operational and staffing costs to achieve defined performance standards.

Master plan: a term used extensively by town planners. For the purposes of this Report, it is defined as a blueprint for future infrastructure requirements of a region or country. It will cover seven or more years and provide a chronological vision of how the infrastructure will be developed over time. **Master plans** are often very detailed and are also used to guide national decisions on other matters, such as the provision of **social infrastructure**.

Multicriteria analysis: when conducting a **cost benefit analysis** it is possible to impute monetary values against some intangible costs and benefits. However, there are some intangible costs and benefits where monetary values cannot be imputed, for example, a pleasant view or the societal benefits public transport can offer those without access to motor cars. **Multicriteria analysis** is a methodology that attempts to evaluate such intangible costs and benefits.

Net present value (NPV): the sum of the **present values** (PVs) of the **discounted** incoming and outgoing of the cash flows of a project.

Outsourcing contracts: short-term private maintenance contracts, often of one or two years in duration, entered into for the management of discrete parts of an infrastructure asset. They are often viewed as the first stage towards private involvement in **economic infrastructure**.

Planning fallacy: underestimating the length of time a project will take to build, or the total construction costs or maintenance costs.

Present value: the value on a given date of a payment or series of payments to be made at a future date.

Primary investors: equity investors who invest in projects from commencement. These are often the construction companies and operating sub-contractors. Compare to **secondary investors**.

Project finance: the creation of a legally independent project company (a **special purpose vehicle**) with the objective of financing a single asset/project. The investors' (equity) and lenders' (commercial debt) repayments are wholly dependent on the performance and future revenue streams (cash flows) of the project, or in certain instances wholly or partly on the future asset value.

Project preparation phase: once governments have approved a project in principle there is a lot of further work required before projects are "**bankable**" and can be tendered, including updated and detailed demand forecasts, updated and more accurate designs and project costing, land acquisition, environmental approvals, land planning matters, choosing the appropriate procurement methodology, finalizing tender documents and market sounding.

Public-private collaboration/public-private cooperation: an arrangement like a **public-private partnership**, but where all the required aspects of a **public-private partnership** are not met, for

example, there is no clear contractual arrangement on the delivery of public infrastructure and/ or public services, or the arrangement is of a very short-term nature.

Public-private partnership (PPP): according to the World Bank, no broad international consensus exists on what constitutes a PPP. However, by the World Bank's *Public-Private Partnerships: Reference Guide Version 1.0* report defines a PPP as a "long-term contract between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility" (p.11).

Real terms: prices once the effects of inflation have been removed.

Reference case: see **do nothing/do minimum**.

Secondary investors: investors who will buy already existing (**brownfield**) assets and will tend to have lower required equity rates of return compared to **primary investors** if the assets are already operational and are then perceived to have lower risks.

Soft infrastructure: the public institutions required to maintain society. Examples include central government buildings and laws and rules that are created to upkeep law and order, improve educational attainment and address public health issues.

Social infrastructure: projects that involve building and/or operating infrastructure assets to support the provision of public services. Examples include social housing, health facilities and educational establishments.

Special purpose vehicle (SPV): a legally independent project company formed for the purpose of financing a single infrastructure project.

Staging gate: points during the planning and construction phases when it is possible to take stock and decide whether to continue or change course. Assumptions can be revisited and verified to see if they are still accurate. This temporary stalling technique is used to keep projects on track and enables projects to be cancelled or changed if assumptions have altered, potentially saving considerable sums of money if, for example, demand projections are much lower than projected.

Strategic infrastructure: economic infrastructure projects that are most strategic and create the greatest impact in terms of economic growth, social uplift and sustainability.

Strategic Infrastructure Planner Framework: a planning framework produced by the World Economic Forum to evaluate a country's infrastructure readiness against 14 parameters. The 14 parameters are split into four main groupings: infrastructure quality metrics, government readiness metrics, social readiness metrics and market readiness metrics.

Strategic Infrastructure Planner Tool: a tool prepared by the World Economic Forum that draws on the **Strategic Infrastructure Planner Framework**. The tool encourages stakeholders to discuss the performance of their country against each of the 14 parameters, where 0 (or 0%) is deemed to be wholly unacceptable and 10 (or 100%) is the perceived optimum (not maximum) for the country at its current stage of development. To frame the issue, stakeholders can be asked to compare their country to a neighbouring country perceived as having appropriate/optimal infrastructure that is at a similar stage of economic development.

Total cost of ownership: see **whole lifecycle cost analysis**.

Trillion: a thousand **billion** or a million **million**.

Whole lifecycle cost analysis: an approach that evaluates all the financial costs and benefits over the life of a project, including construction costs, lifecycle and maintenance costs, and decommissioning costs. Equivalent terms are **whole lifecycle performance analysis** and the **total cost of ownership**.

Whole lifecycle performance analysis: see **whole lifecycle cost analysis**.

Yield: the effective annual return bond holders require for issuing bonds. The **yield** to maturity is the promised **yield** (the internal rate of return) on the bond if purchased at the current price and held to its maturity.

Appendix 16

End Notes

- Further information about the PIDA programme is available on the African Development Bank's website: <http://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/programme-for-infrastructure-development-in-africa-pida/> (accessed 11 June 2012)
- Romp, W. and J. de Haan. *Public Capital and Economic Growth: a Critical Survey*. European Investment Bank Papers Volume 10, Number 1/2005, pp. 40-70.
- Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011, p. 2.
- Égert, B., T. Kozluk and D. Sutherland. *Infrastructure and Growth: Empirical Evidence*. In OECD Economics Department Working Papers 685. OECD Publishing. 2009. With a caveat about different countries having different time series of data, 21% of road projects, 20% of rail projects and 15% of electricity and telephone networks generated fewer benefits than the capital expenditure.
- World Bank Group. *Infrastructure Projects: A review of Cancelled Projects*. Note number 252. January, 2003.
- KPMG/ Economist Intelligence Unit. *The Changing Face of Infrastructure: Frontline Views from Private Sector Infrastructure Providers: Perspectives on Investment, Skills and Training, Sustainability, and Working with Governments*. July, 2009.
- IMF World Economic Outlook, April, 2012. <http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/index.aspx> accessed 2 July 2012. The IMF report 2011 GDP in purchasing power parity terms as US\$ 78,897 billion. Purchasing power parity (PPP) is an economic tool that compares the cost of a "typical" basket of goods across countries and provides a more accurate estimate of global GDP.
- African Development Bank, Asian Development Bank, et al. *Supporting Infrastructure Development in Low- Income Countries: Submission to the G20 by the MDB Working Group on Infrastructure. Interim Report*. June, 2011, p. 2.
- World Economic Forum. *The Global Competitiveness Report 2011-12*. September, 2011.
- African Development Bank, Asian Development Bank, et al. *Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure*. October 2011.
- IHS. *Global Construction Outlook Executive Overview*. Second Quarter 2012.
- G20 Seoul Summit Final Declaration. *The G20 Seoul Summit Leaders' Declaration*. November, 2010. pp. 5-6.
- World Bank Group. *Deterioration in Developing Countries: Causes and Consequences*. 1998.
- Heggie, I.G. and P. Vickers. *Commercial Management and Financing of Roads*. Technical Paper 409, World Bank, Washington DC. 1998.
- Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011, p. 85.
- Further information is provided in Chapter 3 ("The Future of Infrastructure in North America") of the World Economic Forum. *Positive Infrastructure: A Framework for Revitalizing the Global Economy*. 2010.
- Mahon, C. and A. Sloan, *London Under Livingstone: An Evaluation of Labour's Mayor*. Bow Group, September, 2007. p. 3.
- For a definition of Public-Private Partnerships and concessions see Parts A.5 and B.1.
- C40 Cities Climate Leadership Group website <http://www.c40climate.com/c40blog/c40-cities-program-update> accessed 4 July 2012
- HM Treasury. *Infrastructure Cost Review: Main Report*. 2010.
- G20 High-Level Panel. *High-Level Panel on Infrastructure Recommendations to G20 – Final Report*. October, 2011. p.9, and World Economic Forum and International Chamber of Commerce. *G20 Task Force: Final Report*. September, 2011. p.46.

The figures presented are estimated figures with the authors stating "Estimates are based on a variety of extrapolation methods applied to incomplete data sets." Further detail is provided in African Development Bank, Asian Development Bank, et al. Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure, Annex I, *Infrastructure Needs in Developing Countries*. October, 2011, p. 7-8 with each region comprising:

- East Asia and Pacific – information is drawn from Bhattacharyay, B.N. *Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010–2020*. Asian Development Bank Institute Working Paper No. 248. 2010. The needs are estimated for the 2010–20 period. The countries included in the analysis are Cambodia, Fiji, Indonesia, Kiribati, Lao PDR, Malaysia, Marshall Islands, Mongolia, Myanmar, Papua New Guinea (PNG), People's Republic of China, Philippines, Samoa, Solomon Islands, Thailand, Tonga, Vanuatu and Vietnam. Excluded are Japan, North Korea, South Korea, Australia and New Zealand.
- Central Asia – information is drawn from Bhattacharyay, B. N. *Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010–2020*. Asian Development Bank Institute Working Paper No. 248. 2010. The needs are estimated for the 2010–20 period. The countries included in the analysis are Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, and Uzbekistan.
- Latin America and the Caribbean – information is drawn from Fay, M. and M. Morrison. *Infrastructure in Latin America and the Caribbean: Recent Developments and Key Challenges*. World Bank Group. 2007. The needs are estimated for the 2005–15 period. The model assumes 2.7% real growth.
- Middle East and North Africa – information is drawn from World Bank. *MENA Regional Conference on Infrastructure Reform and Regulation: Taking the Infrastructure Agenda Forward in the Middle East and North Africa*. 2009. The needs are estimated for the 2008-2015 period. See the website: <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/0,,contentMDK:22424809~pagePK:146736~piPK:226340~theSitePK:256299,00.html> (accessed 18 June 2012)
- South Asia – information is drawn from Bhattacharyay, B. N. *Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010–2020*. Asian Development Bank Institute Working Paper No. 248. 2010. The needs are estimated for the 2010–20 period. The countries included in the analysis are– Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka.
- Sub-Saharan Africa – information is drawn from Foster, V. and C. Briceño-Garmendia. *Africa's Infrastructure: A Time for Transformation*. Agence Française de Développement and the World Bank. 2010. The needs are for the 2006–15 period. The share of GDP is recalculated and is based on the projected GDP in that period (not 2005 GDP).
- The framework has also built upon some of the economic and social themes from the World Economic Forum report. *Positive Infrastructure: A Framework for Revitalizing the Global Economy*. May, 2010. pp. 6-7.
- The World Bank's Development Indicators (accessed at <http://data.worldbank.org/indicator> on 18 June 2012) have statistics for air transport (registered carrier departures worldwide), container port traffic, electricity consumption (kWh per capita), fixed broadband Internet subscribers, mobile cellular subscriptions, the percentage of the population with access to potable water, the length of railroads, the length of roads and the percentage of roads that are paved.
- Africa Infrastructure Country Diagnostic, accessed at <http://www.infrastructureafrica.org/countries> on 16 April 2012.
- Reporters Without Borders Website <http://en.rsf.org/> accessed 25 June 2012
- The World Bank's Private Participation in Infrastructure (PPI) Project Database website is found at <http://ppi.worldbank.org/> accessed on 20 June 2012
- McNamee, P. and J. Celona. *Decision Analysis for the Professional*. 4th Edition. 2005. SmartOrg.
- Page 57 of the World Economic Forum's Positive Infrastructure: A Framework for Revitalizing the Global Economy report explains that bribery in the construction sector can often account for 10% or more of the contract price. This explains why the G20 Cannes Summit's final declaration emphasizes the importance of transparency, fully supporting the World Bank's Construction Sector Transparency Initiative (CoST) – www.constructiontransparency.org (accessed 18 June 2012)
- At the World Economic Forum Annual Meeting 2012 in Davos-Klosters, there was some debate as to whether two additional parameters need to be added in addition to the "Government's track record of infrastructure project metrics", notably:
 - "evidence of clear government methodologies to undertake feasibility studies"
 - "a published pipeline of well-planned infrastructure projects".
 These additional two parameters are relevant, but for the purposes of this report are assumed to be subsumed within this parameter.
- See Section 4 of HM Treasury. *National Infrastructure Plan 2011*. November, 2011.
- Gray, P. *Private Participation in Infrastructure: A Review of the Evidence*. Private Sector Advisory Services, World Bank Group. October, 2001. p. 21.
- Kerf, M., R.D. Gray et al. *Concessions for Infrastructure: A Guide to Their Design and Award*. World Bank Technical Papers No.399. 1998. pp. 58-69.

33. Nellis, J. and S. Kikeri. *Privatisation in Competitive Sectors: The Record to Date*. World Bank Policy Research Working, Paper No. 2860. June, 2002 and Megginson, W.L. and J.M. Netter. *From State To Market: A Survey Of Empirical Studies On Privatisation*. Journal of Economic Literature. June, 2001.
34. The World Bank Body of Knowledge on Infrastructure Regulation (BoKIR) website is which provides further guidance. and is accessible at <http://www.regulationbodyofknowledge.org/>
35. Gray, P. *Private Participation in Infrastructure: A Review of the Evidence*. Private Sector Advisory Services, World Bank Group. October, 2001. p. 5.
36. *Ibid.*, p. 17.
37. Website <http://www.aveva.com/EN/finance-402/shareholding-structure-of-the-world-leader-in-the-nuclear-industry-and-major-player-in-bioenergies.html> accessed 3 June 2012
38. Hussain, M.Z. *Investment in Air Transport Infrastructure: Guidance for Developing Private Participation*. World Bank Group, 2010. p. 198 and p. 210.
39. Alberto Alemán Zubieta, Administrator of the Panama Canal Authority speaks out on the community on YouTube, with movie clip uploaded by the World Business Council for Sustainable Development on 28 February 2007 http://www.youtube.com/watch?v=kRB_nSE6IS0 accessed on 4 July 2012.
40. Public Private Partnerships (PPPs) are explained in detail in Section B.1, with World Bank's report *Public-Private Partnerships: Reference Guide Version 1.0*. February, 2012 defining a PPP as a "long-term contract between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility." (p.11)
41. HM Treasury. *Standardisation of PFI Contracts Version 4 Addendum: Amended Refinancing Provisions*. April, 2009.
42. World Bank's Public-Private Infrastructure Advisory Facility at <http://www.ppiaf.org/page/knowledge-center/ppp-resources> accessed on 18th June 2012
43. Inter-American Development Bank. *Financial Structuring of Infrastructure Projects in Public Private Partnerships: An Application to Water Projects*. December, 2006.
44. KPMG/ Economist Intelligence Unit. *The Changing Face of Infrastructure: Frontline Views from Private Sector Infrastructure Providers: Perspectives on Investment, Skills and Training, Sustainability, and Working with Governments*. July, 2009. pp. 9-10.
45. World Bank Group. *Measuring and Reducing the Impact of Corruption in Infrastructure*. World Bank Policy Research Working Paper 4099. 2006. p. 2.
46. There are a number of ideas being developed to compensate for environmental damage, including Mittal, V. *Grow Forest Certificate*. Unpublished, March 2012.
47. World Bank Group and Infrastructure Consortium for Africa. *Attracting Investors to African Public-Private Partnerships: A Project Preparation Guide*. 2009. p. 41.
48. African Development Bank, Asian Development Bank, et al. *Supporting Infrastructure Development in Low-Income Countries, Submission to the G20 by the MDB Working Group on Infrastructure*. Interim Report. June 2011. p. 6.
49. African Development Bank, Asian Development Bank, et al. *Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure*. October 2011. p. 10.
50. Further information about the NEC3 suite of contracts is available at <http://www.neccontract.com/index.asp> accessed on 3 July 2012.
51. Konchar, M. and V. Sanvido. *Comparison of U.S. Project Delivery Systems*. Journal of Construction Engineering and Management, Vol.124, No. 6. November/ December, 1998. pp. 435-444.
52. Hale, D.R., P.P. Shrestha, et al. *Empirical Comparison of Design/Build and Design/Bid/Build Project Delivery Methods*. Journal of Construction Engineering and Management, Vol. 135, No. 7. July, 2009. pp. 579-587.
53. World Bank Group. *Public-Private Partnerships: Reference Guide Version 1.0*. February, 2012. p.11.
54. National Audit Office. *Performance of PFI Construction*. October, 2009. p. 17.
55. The Economist. *Civil-service Reform: Learning Mandarin*. 21 April, 2012.
56. Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011. p. 93.
57. HM Treasury. *National Infrastructure Plan, 2011*. November, 2011. p. 91.
58. Department of Trade and Industry, United Kingdom. *Rethinking Construction: The Report of the Construction Task Force to the Deputy Prime Minister*. 1998, p. 36.
59. HM Treasury. *National Infrastructure Plan 2011*. November 2011. p. 107.
60. Project Finance. *Deal Analysis: Paris Courthouse*. 2 April 2012.
61. World Economic Forum and International Chamber of Commerce. *G20 Task Force: Final Report*. September, 2011. p.47.
62. Chan, E. and M. Worth. M. *Basel III and Project Finance*. Project Finance International, Issue 460, 29 June, 2011.
63. HM Treasury. *PFI: Strengthening Long Term Partnerships*. March, 2006. p. 82.
64. Weber, B. and H.W. Alfen. *Infrastructure as an Asset Class: Investment Strategy, Project Finance and PPPs*. Wiley Finance, 2010.
65. Standard & Poor's Foreign Currency Risk Rating for Chile as of 3 February 2012.
66. Project Management Institute website <http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx> accessed 18 June 2012.
67. Project Management Institute. *A Guide to the Project Management Body Knowledge, Fourth Edition (PMBOK® Guide)*. 2008, p. 434.
68. Prieto, B. *Ten Common Problems on Poor Performing Programs*. Project Management World Today. August, 2011.
69. Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011. p. 89.
70. Olympic Delivery Authority. *ODA Lifetime Corporate Plan Summary*. 2007.
71. British Broadcasting House (BBC). *London 2012 Olympics building programme "88% complete"*. 19 July, 2011, <http://www.bbc.co.uk/news/uk-14201730> accessed on 18 June 2012.
72. Ipsos MORI Social Research Institute. *Investigating the Performance of Operational PFI Contracts: A Research Study Conducted for Partnerships UK on Behalf of HM Treasury*. February, 2009.
73. African Development Bank, Asian Development Bank, et al. *Supporting Infrastructure Development in Low-Income Countries: Submission to the G20 by the MDB Working Group on Infrastructure. Interim Report*. June, 2011.
74. African Development Bank, Asian Development Bank, et al. *Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure, Annex I, Infrastructure Needs in Developing Countries*. October, 2011. p. 7.
75. A cross check of the global infrastructure need estimate of 4.50% can be calculated algebraically by saying if the average investment need in the Figure 1 regions is 6.2% and these represent approximately 45% of 2011 global GDP (in purchasing power parity terms as calculated by the IMF World Economic Outlook) then the average for the Americas, Europe, Australasia and Japan and Taiwan which represent approximately 55% of 2011 global GDP needs to be 3.10% which is consistent with the range of 3%-9% per annum.
76. World Economic Forum. *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010. p.6.
77. IHS. *Global Construction Outlook Executive Overview*. Second Quarter 2012. IHS figures are estimated by collating construction spending data from national statistics, United Nations, OECD and other sources. To avoid annual figures being distorted by large swings in market exchange rates IHS converts national expenditures to US dollars using 2005 market exchange rates.
78. World Economic Forum. *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010. p.9.
79. McNamee, P. and J. Celona. *Decision Analysis for the Professional*. 4th Edition. 2005, SmartOrg.
80. HM Treasury. *The Green Book, Appraisal and Evaluation in Central Government*. 2011. Annex 2 (Valuing Non-Market Impacts).
81. One approach for conducting multicriteria analysis is the Delphi method. The Delphi method is a structured communication technique that encourages individuals (or groups of individuals) to provide their views to a facilitator who collects the information anonymously. The facilitator then summarizes the results to the group, who are asked to provide their views again. It is believed that this approach creates a more balanced analysis by giving stakeholders an opportunity to reflect on what they have heard. It can also create greater stakeholder consensus.
82. HM Treasury. *Valuing Infrastructure Spend: Supplementary Guidance to the Green Book*. November 2011.
83. Congressional Budget Office. *The Economic Effects of Federal Spending on Infrastructure and Other Investments*. 1998.
84. United States Government Accountability Office. *Discount Rate Policy*. 1991.
85. Office of Management and Budget. *Circular A-94 Appendix C: Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses*. 2011.
86. Treasury Board of Canada Secretariat. *Canadian Cost-Benefit Analysis Guide (Interim)*. 2007.
87. World Economic Forum. *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010. Appendix A.3.
88. *Ibid.* This Appendix provides further detail but does not attempt to substitute for all the complex United States of America Internal Revenue Service rules.
89. When banks lend money they either require the annual interest and debt repayments to be the same every year (as with a fixed rate mortgage) or they allow the debt repayments to be sized to the amount of available cash flows in each period. The later is called a sculpted debt profile.
90. This figure is a World Economic Forum estimate which includes national and local/ state level units.

Appendix 17

References



- African Development Bank, Asian Development Bank, et al. *Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure*. October 2011.
- African Development Bank, Asian Development Bank, et al. *Infrastructure Action Plan: Submission to the G20 by the MDB Working Group on Infrastructure, Annex I, Infrastructure Needs in Developing Countries*. October 2011.
- African Development Bank, Asian Development Bank, et al. *Supporting Infrastructure Development in Low-Income Countries, Submission to the G20 by the MDB Working Group on Infrastructure. Interim Report*. June 2011.
- Asian Development Bank. *ADB's Solar Power Generation Guarantee Facility in India*. November, 2011.
- Asian Development Bank. *Engaging Private Sector Capital at Scale in Financing Low-Carbon Infrastructure in Developing Countries*. 2011.
- Australian Government, Infrastructure Australia. *A Report to the Council of Australian Governments*. December, 2008.
- Australian Government, Infrastructure Australia. *Communicating the Imperative for Action: A Report to the Council of Australian Government*. June, 2011.
- BBVA. *Economic Watch Pensions: Infrastructure Investment and Pension Funds in Chile*. May 2011.
- Bhattacharyay, B. N. *Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010–2020*. Asian Development Bank Institute Working Paper No. 248. 2010.
- Boardman, A. and et al. *Cost Benefit Analysis: Concepts and Practice*. New York: Prentice Hall. 2005.
- British Broadcasting House (BBC). *London 2012 Olympics Building Programme '88% Complete'*. 19 July 2011, <http://www.bbc.co.uk/news/uk-14201730> accessed on 18 June 2012.
- Burgess, D. *Reconciling Alternative Views about the Appropriate Social Discount Rate*. Working Paper. June 2011.
- Burgess, D and G Jenkins. *Discount Rates for Evaluation of Public and Private Partnerships*. Kingston, Canada: Queen's University. 2010.
- Chan, E. and M. Worth. *Basel III and Project Finance*. Project Finance International, Issue 460. 29 June 2011.
- Construction Sector Transparency Initiative. *CoST Ethiopia: Briefing Note 10*. July, 2011 (updated March 2012).
- Congressional Budget Office. *The Economic Effects of Federal Spending on Infrastructure and Other Investments*. 1998.
- Commonwealth of Australia. *Handbook of Cost-Benefit Analysis*. 2006.
- Department of Trade and Industry, United Kingdom. *Rethinking Construction: The Report of the Construction Task Force to the Deputy Prime Minister*. 1998.
- Dowall, D.E and R. Ried. 2008. *A Strategy for Infrastructure: The California Infrastructure Initiative*. In Access, University of California Transportation Centre, Spring 2008, 32:18-25.
- Égert, B., Kozluk, T. and D. Sutherland. *Infrastructure and Growth: Empirical Evidence*. In OECD Economics Department Working Papers 685, OECD Publishing. 2009.
- European Commission. *Stakeholder Consultation Paper: Commission Staff Working Paper on the Europe 2020 Project Bond Initiative*. February, 2011.
- Fay, M. and M. Morrison. *Infrastructure in Latin America and the Caribbean: Recent Developments and Key Challenges*. World Bank Group. 2007.
- Financial Times. *Finland's Nuclear Power Plant Becomes Showcase for Hassles, Delays and Cost-Overruns*. 3 November 2009.
- Financial Times. *Investors May Walk After Spain's Solar Cut*. 9 January 2011.
- Foster, V. and C. Briceño-Garmendia. *Africa's Infrastructure: A Time for Transformation*. Agence Française de Développement and the World Bank. 2010.
- G20 Cannes Summit Final Declaration. *Building Our Common Future: Renewed Collective Action for the Benefit of All*. November, 2011.
- G20 High-Level Panel. *High-Level Panel on Infrastructure Recommendations to G20 – Final Report*. October, 2011.
- G20 Seoul Summit Final Declaration. *The G20 Seoul Summit Leaders' Declaration*. November, 2010.
- Government of Mexico. *2007-2012 National Infrastructure Program*. 2007
- Gray, P. *Private Participation in Infrastructure: A Review of the Evidence*. Private Sector Advisory Services, World Bank Group. October 2001.
- Greater London Authority. *The London Plan: Spatial Development Strategy for Greater London*. July, 2011.
- Guardian Newspaper. *India Records World-beating Green Energy Growth*. 3 February, 2012.
- Hale, D.R., P.P. Shrestha et al. *Empirical Comparison of Design/Build and Design/Bid/Build Project Delivery Method*. Journal of Construction Engineering and Management, Vol. 135, No. 7. July, 2009. pp. 579-587.
- Heggie, I.G. and P. Vickers. *Commercial Management and Financing of Roads*. Technical Paper 409, World Bank, Washington DC. 1998.
- Henckel, T. and W. McKibbin. *The Economics of Infrastructure in a Globalized World: Issues, Lessons and Future Challenges*. Brookings Institute. June, 2010.

- HM Treasury. *Infrastructure Cost Review: Main Report*. December, 2010.
- HM Treasury. *National Infrastructure Plan 2010*. October, 2010.
- HM Treasury. *National Infrastructure Plan 2011*. November, 2011.
- HM Treasury. *PFI: Strengthening Long Term Partnerships*. March, 2006.
- HM Treasury. *Standardisation of PFI Contracts Version 4 Addendum: Amended Refinancing Provisions*. April, 2009.
- HM Treasury. *Strategy for National Infrastructure*. March, 2010.
- HM Treasury. *The Green Book: Appraisal and Evaluation in Central Government*. July, 2011.
- HM Treasury. *Valuing Infrastructure Spend: Supplementary Guidance to the Green Book*. November, 2011.
- HM Treasury/ National Audit Office. *Equity Investment in Privately Financed Projects*. February, 2012.
- Hussain, M.Z. *Investment in Air Transport Infrastructure: Guidance for Developing Private Participation*. World Bank Group, 2010.
- IHS. *Global Construction Outlook Executive Overview*. Second Quarter 2012.
- Institute of Civil Engineering Proceedings. *Delivering London 2012: Organisation and Programme*. Institute of Civil Engineering, Volume, 164 May 2011, p.5-12.
- Inter-American Development Bank. *Financial Structuring of Infrastructure Projects in Public Private Partnerships: An Application to Water Projects*. December, 2006.
- International Federation of Consulting Engineers (FIDIC). *Conditions of Contract for Construction: For Building and Engineering Works Designed by the Employer – Red Book*. First Edition, 1999.
- International Federation of Consulting Engineers (FIDIC). *Conditions of Contract for Design, Build and Operate Projects – Gold Book*. First Edition, 2008.
- International Federation of Consulting Engineers (FIDIC). *Conditions of Contract for EPC/ Turnkey Projects – Silver Book*. First Edition, 1999.
- International Federation of Consulting Engineers (FIDIC). *Conditions of Contract for Plant and Design-Build: For Electrical and Mechanical Plant, and For Building and Engineering Works, Designed by the Contractor – Yellow Book*. First Edition, 1999.
- International Finance Corporation. *Toll Roads: Concessions the Ruta del Sol*. In International Finance Corporation Telling Our Story: Infrastructure: How the Private Sector Helps. 2012 Vol. 6/ Issue 1. p.32-33.
- International Finance Corporation. *Success Stories: Romania: Bucharest Water and Sanitation (RGAB)*. April, 2010.
- Ipsos MORI Social Research Institute. *Investigating the Performance of Operational PFI Contracts: A Research Study Conducted for Partnerships UK on Behalf of HM Treasury*. February, 2009.
- Jane's Transport Finance. *Panama Canal Lands Funding*. October, 2008.
- Kerf, M., R.D. Gray et al. *Concessions for Infrastructure: A Guide to Their Design and Award*. World Bank Technical Papers No.399. 1998.
- KPMG/ Economist Intelligence Unit. *The Changing Face of Infrastructure: Frontline Views from Private Sector Infrastructure Providers: Perspectives on Investment, Skills and Training, Sustainability, and Working with Governments*. July, 2009.
- Konchar, M. and V. Sanvido. *Comparison of U.S. Project Delivery Systems*. Journal of Construction Engineering and Management. Vol.124, No. 6, November/ December, 1998, pp. 435-444.
- Mahon, C. and A. Sloan. *London Under Livingstone: An Evaluation of Labour's Mayor*. Bow Group. September 2007.
- McNamee, P. and J. Celona. *Decision Analysis for the Professional*. 4th Edition. 2005, SmartOrg.
- Megginson, W.L. and J.M. Netter. *From State To Market: A Survey Of Empirical Studies On Privatisation*. Journal of Economic Literature. June 2001.
- Ministry of Infrastructure, Ontario. *Building Together: Jobs & Prosperity for Ontarians*. 2011.
- Mittal, V. *Grow Forest Certificate*. Unpublished. March 2012.
- National Audit Office. *Lessons from PFI and Other Projects*. April, 2011.
- National Audit Office. *Performance of PFI Construction*. October, 2009.
- Nellis, J. and S. Kikeri. *Privatisation in Competitive Sectors: The Record to Date*. World Bank Policy Research Working, Paper No. 2860. June, 2002.
- Office of Management and Budget. *Circular A-94 Appendix C: Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses*. 2011.
- Olympic Delivery Authority. *ODA Lifetime Corporate Plan Summary*. 2007.
- Organisation for Economic Co-operation and Development (OECD). *Infrastructure to 2030: Telecom, Land Transport, Water and Electricity*. OECD Publishing. 2006.
- Organisation for Economic Co-operation and Development (OECD). *Strategic Transport Infrastructure Needs to 2030*. OECD Publishing. 2012.
- Prieto, B. *Ten Common Problems on Poor Performing Programs*. Project Management World Today. August, 2011.
- Project Finance. *Deal Analysis: Paris Courthouse*. 2 April 2012.
- Project Management Institute. *A Guide to the Project Management Body Knowledge Fourth Edition (PMBOK® Guide)*. 2008.
- Romp, W. and J. de Haan. *Public Capital and Economic Growth: a Critical Survey*. European Investment Bank Papers Volume 10, Number 1/2005, pp. 40-70.
- Seoul G20 Business Summit Organizing Committee. *Seoul G20 Business Summit: Findings and Recommendations From Participants*. November, 2010.
- The Economist. *Civil-service Reform: Learning Mandarin*. 21 April, 2012.
- The Economist. *Emerging-market Multinationals: The Rise of State Capitalism: Pros and Cons Mixed Bag*. 21 January, 2012.
- The Scotsman. *Hollywood's World Class Price Overrun*. 28 August 2003.
- The Washington Post. *On Dec 31, It's Official: Boston's Big Day Will Be Done*. 26 December, 2007.
- Treasury Board of Canada Secretariat. *Canadian Cost-Benefit Analysis Guide (Interim)*. 2007.
- United States Government Accountability Office. *Discount Rate Policy*. 1991.
- Ward, M. *Engaging Private Sector Capital at Scale in Financing Low Carbon Infrastructure in Developing Countries*. Asian Development Bank, Published in Cancun. November 2010.
- Weber, B. and H.W. Alfen. *Infrastructure as an Asset Class: Investment Strategy, Project Finance and PPPs*. Wiley Finance. 2010.
- White and Case. *Client Alert: Updated Mexican Public Infrastructure Projects, 2011*. February 2011.
- World Bank Group. *Africa Infrastructure Knowledge Program*. <http://www.infrastructureafrica.org/> accessed on 18 June 2012.
- World Bank Group. *Ethiopia's Infrastructure: A Continental Perspective*. March, 2010.
- World Bank Group. *Infrastructure Projects: A Review of Cancelled Projects*. Note number 252. January, 2003.
- World Bank Group. *Measuring and Reducing the Impact of Corruption in Infrastructure*. World Bank Policy Research Working Paper 4099. 2006
- World Bank Group. *MENA Regional Conference on Infrastructure Reform and Regulation: Taking the Infrastructure Agenda Forward in the Middle East and North Africa*. 2009.
- World Bank Group. *Output-Based Aid in Chad: Using Performance-Based Contracts to Improve Roads*. World Bank. April, 2005.
- World Bank Group. *Public-Private Partnerships: Reference Guide Version 1.0*. February, 2012.
- World Bank Group. *Road Deterioration in Developing Countries: Causes and Consequences*. 1998.
- World Bank Group. *Sustainable Infrastructure Action Plan FY2009-2011*. 2008 accessed at <http://siteresources.worldbank.org/INTSDNETWORK/Resources/SIAPfinal.pdf> on 18 June 2012.
- World Bank Group. *The Role of Communication in Large Infrastructure: The Bumbuna Hydroelectric Project in Post-Conflict Sierra Leone*. World Bank Working Paper 84. June, 2006.
- World Bank Group. *Viewpoint: Water in Bucharest: A Utility's Efficiency Gains Under a Concession*. January 2011.
- World Bank Group. *World Bank Loan to Support the National Urban Transit Programme Project*. June 2011
- World Bank Group and Infrastructure Consortium for Africa. *Attracting Investors to African Public-Private Partnerships: A Project Preparation Guide*. 2009.
- World Bank Institute. *PPPs in Infrastructure. Day 3: Session 13.3. Korean PPP Experience*. Course run in September, 2008. http://siteresources.worldbank.org/ECAEXT/Resources/Day3Session13_3.pdf accessed 4 July 2012.
- World Economic Forum and International Chamber of Commerce. *G20 Task Force: Final Report*. September, 2011.
- World Economic Forum. *Benchmarking National Attractiveness for Private Investment in Latin American Infrastructure*. 2007.
- World Economic Forum. *Financing Green Growth in a Resource-constrained World: Partnerships for Triggering Private Finance at Scale*. February, 2012.
- World Economic Forum. *Paving the Way: Maximizing the Value of Private Finance in Infrastructure*. August, 2010.
- World Economic Forum. *Positive Infrastructure: A Framework for Revitalizing the Global Economy*. May, 2010.
- World Economic Forum. *Putting the New Vision for Agriculture into Action: A Transformation Is Happening*. April, 2012.
- World Economic Forum. *Scaling Up Renewables: Developing Renewable Energy Capacity – Addressing Regulatory and Infrastructure Challenges in Emerging Markets*. April, 2011.
- World Economic Forum. *The Global Competitiveness Report 2011-12*. September 2011.



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