1. Infrastructure provision

THE INFRASTRUCTURE CHALLENGE

This volume is concerned with public infrastructure and its provision in terms of the selection, procurement and the delivery of infrastructure projects. Basic supporting infrastructure, such as bridges, roads, railway networks, ports, water systems, hospitals and the power grid have in common that all involve large, lumpy, long-term investments that are not easily reversed. Given these characteristics, it is important to get decisions right. The challenge for public policy is to have facilities built that are able to provide the infrastructure services that the community wants and for which it is willing to pay. That is, the infrastructure must meet the needs of society at a reasonable cost. Once selected, projects can be delivered in a variety of ways under different contractual arrangements, although almost invariably with the great bulk of the work undertaken by the private sector, at least in most developed countries. Consequently, it is not so much a matter of public versus private, but how best to harness public and private sector resources and capabilities by choosing the most appropriate delivery model for the job and then implementing it successfully, while avoiding unnecessary costs and delays.

It goes without saying that these conditions are easier said than done, and the history of infrastructure is littered with examples where these requirements are honoured more in the breach. Nevertheless, while imperfect, the most successful economies are those in which the infrastructure 'works' to the extent that, although used daily, it is simply taken for granted. Yet, it 'shapes our lives, our relationships with each other, the opportunities we enjoy, and the environment we share' (Frischmann, 2012, p. ix). A subject matter that has such a profound bearing on our lives (and livelihoods) ought not be ignored, and warrants our attention.

Indeed, now seems an opportune time to examine (and in our case, re-examine) public procurement policies, since infrastructure has been elevated to the forefront of the global economic agenda. As of 2017 there appears to be an acceptance, albeit reluctant, that the world economy may have slipped into what former United States (US) Treasury secretary Larry Summers calls 'The Age of Secular Stagnation', a description that borrows

from the concept of secular stagnation first put forward by the American economist Alvin Hansen in the 1930s. The failure of economies fully to recover from the 2008 financial crisis has left a legacy of weak economic growth, low or negative interest rates, rising asset prices, low wage growth, greater inequality and weak investment. In an article published in *Foreign Affairs*, Summers (2016) considered that there is a risk that the current slowdown may prove to be enduring rather than cyclical, and that the world might still be only part-way through a slow-growth era 'shaped by previously unthinkable and far-fetched policies' such as ultra-low interest rates, noting that at least two dozen countries have central bank policy rates just above or below the zero level, a position considered inconceivable even a few years ago. So as to bring about and sustain such low rates in their own countries, central banks in the G-7 collectively expanded their balance sheets since the onset of the financial crisis by a staggering $5 trillion. This figure is roughly twice as large as the gross domestic product (GDP) of the United Kingdom, and just less than one-third of the GDP of the United States.

In an address in Frankfurt in April 2016, International Monetary Fund (IMF) managing director Christine Lagarde also expressed concern that the risks had increased of economies becoming trapped in a 'new mediocre' of growth, the danger being that low growth can be self-reinforcing through 'negative effects' that are hard to reverse. In her words, 'the good news is that the recovery continues; we have growth; we are not in a crisis'. However, 'the not-so-good news is that the recovery remains too slow, too fragile, and risks to its durability are increasing' (Lagarde, 2016).

Her solution is infrastructure. The policy mix that has driven monetary policy to such experimental, unprecedented extremes needs to change: 'While [monetary] accommodation should continue in most advanced economies, it is clear that monetary policy can no longer be the alpha and omega to recovery'. Rather, according to Lagarde, investing in badly needed infrastructure is an 'obvious area' of potential, boosting global aggregate demand today while laying the building blocks for future growth.

How obvious an area is illustrated by a 2015 paper by Zia Qureshi, a senior fellow at the Brookings Institution, Washington, his being the most recent estimate of the global infrastructure 'gap'. Qureshi argues that the world has been underinvesting in infrastructure such as energy systems, cities, transport and water. Cities form the centrepiece of infrastructure needs, because for the first time in history more people live in cities than elsewhere, and the vast majority of future population growth will be in urban areas (Thodey, 2014). International trade is also expanding rapidly. By 2030, port container and air freight traffic is projected to more than triple, while air passenger demand will likely double.

In all, Qureshi estimates that the investment required in 'sustainable infrastructure' over the 15 years from 2015 to 2030 is in the order of $90 trillion. The emphasis on 'sustainable' is because infrastructure at present accounts for more than half of global carbon emissions. For it to be part of the solution for laying the foundation for growth prospects, rather than a major part of the problem, infrastructure should desirably make its contribution to mitigating adverse impacts on the climate.

According to Qureshi, in order to fill existing infrastructure gaps and meet the anticipated growth in demand, global infrastructure investment on an annual basis will have to double from the current $2.5–3 trillion to around $6 trillion. Most of this increase will need to take place in the developing countries, due to the demands from their differential growth path, rapid urbanization and the large backlog to be caught up in order to remove transport bottlenecks and upgrade water and power systems. In mature economies there is also a backlog in terms of the repair and modernization of once advanced, but now increasingly outmoded infrastructure assets.

For example, as shown in Table 1.1, in the United States the American Society of Civil Engineers Report Card for 2013 found that US infrastructure, with the sole exception of solid waste treatment, was scored 'mediocre [C] to poor [D]' with an overall rating of D+ (Urban Land Institute, 2013).[1] Larry Summers argues that without public investment, future generations 'would be inheriting a vast deferred maintenance liability'. As he notes:

> A time of low real interest rates, low materials prices, and high construction unemployment is the ideal moment for a large public investment program. It is tragic, therefore, that in the United States today, federal infrastructure investment, net of depreciation, is running close to zero, and net government investment is lower than at any time in nearly six decades. (Summers, 2016)

At a global level, the scale of the 'infrastructure challenge' can be measured by the observation of Qureshi (2015, p. 20) that 'assessed infrastructure needs over the next 15 years are almost twice as large as the value of the entire current infrastructure stock (the latter estimated as about $50 trillion)'. Most countries seem likely to fall short of this task. Only China keeps on building, seemingly without limits, and its experience is instructive, albeit controversial.

Table 1.1 American Society of Civil Engineers Infrastructure Report Card 2013

Infrastructure sector	Grade	Trend*
Aviation	D	–
Bridges	C+	↑
Dams	D	–
Drinking water	D	↑
Energy	D+	–
Hazardous waste	D	–
Inland waterways	D−	–
Levees	D−	–
Ports	C	N/A**
Public parks and recreation	C−	–
Rail	C+	↑
Roads	D	↑
Schools	D	–
Solid waste	B−	↑
Transit	D	–
Wastewater	D	↑

Notes:
A = Exceptional.
B = Good.
C = Mediocre.
D = Poor.
F = Failing.
* Compared to 2009 Infrastructure Report Card.
** New category in 2013.

Source: American Society of Civil Engineers (2013), reported in Urban Land Institute (2013).

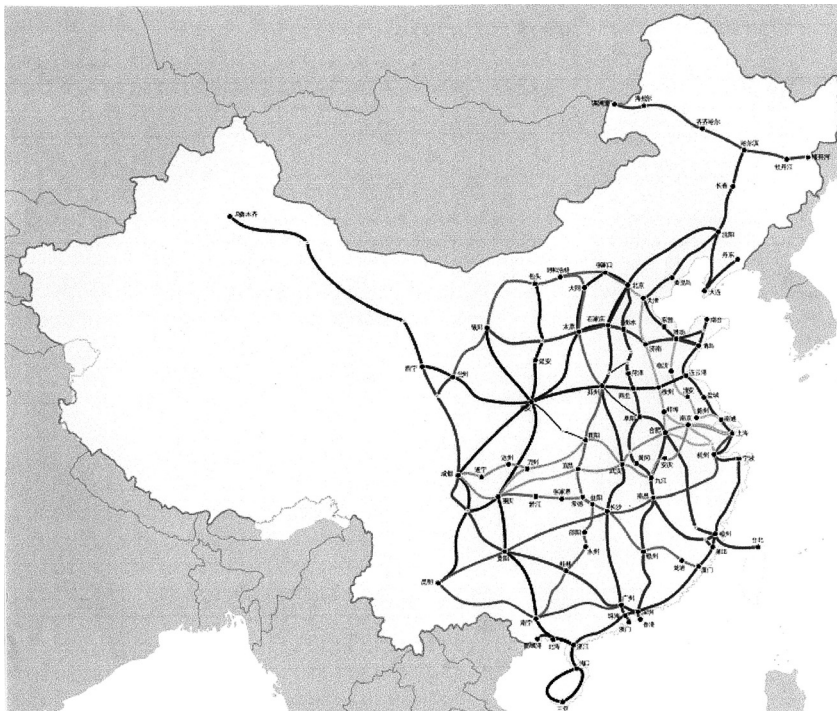
THE CHINA EXAMPLE

No country has invested as much so quickly in infrastructure as has China over the past two or three decades. Moreover, it is encouraging other countries in Asia to follow its path via the Asian Infrastructure Investment Bank, which Larry Summers thinks is 'a valuable step forward, that should be strongly supported by the global community' (Summers, 2016, p. 8). Earlier in July 2014, China set up the Shanghai-headquartered BRICS New Development Bank, together with the four other members of the BRICS club: Brazil, Russia, India and South Africa (*The Economist*, 2014). With these two new banks, along with the Silk Road Fund (a government body which takes minority equity stakes in infrastructure projects),

China is seeking to export its infrastructure-led development model to the rest of the world under the 'One Belt, One Road' strategy of President Xi Jinping, now known as the Belt and Road Initiative (BRI), whereby the Chinese economy is bolstered by building physical infrastructure not just with its immediate and near neighbours (for example, the port facilities and motorways built in Sri Lanka), but in places as far afield as Europe, Africa and the Middle East (Wong, 2016). What role has infrastructure played in China itself?

When the market reforms began in 1979, China was predominantly agrarian, and the urban population was 19 per cent of the total (and only 10.6 per cent when Mao Zedung and the Communist Party came to power in 1949). By contrast, as of 2016, 779 million of China's 1.4 billion people (or 56 per cent of the population) live in cities (Salt, 2016a), and the 50 per cent watershed for defining an urbanized country was crossed in 2010. China now has seven cities with more than 10 million residents, 37 with at least 3 million, and no less than 170 cities with a population of at least 1 million (Wall Street Journal Custom Studios, 2016b). Trillions of dollars spent on infrastructure ($300 billion alone on high-speed rail) has transformed China into an exemplar of modern urban transit, with a platform of expansive highways (such as the 65 000 km National Expressway Network), intercity rail networks and efficient ocean ports. Shanghai has 14 subway lines, two large modern airports, 20 expressways and a bullet-train departure every three minutes (Korporaal, 2016). Although relatively late on the scene for high-speed rail (the first Maglev line from Shanghai's Pudong airport to the city opened in 2004), China was a quick learner and its current 20 000 km of track in use, served by the Chinese-built high-speed rail with a top speed of 300 kmh, is by far the world's largest network (exceeding Europe's 7500 km and Japan's 2700 km network by a large margin).[2] The network includes the world's longest route – covering 1900 km in an eight-hour ride – which opened between Beijing and Guangzhou late in 2012.

China is planning to lay another 15 000 km of high-speed rail by 2025 (*The Economist*, 2017b). At present, there is a four-by-four grid (four north–south and four east–west lines), which is to become an eight-by-eight grid, as illustrated in Figure 1.1, with the eventual aim to have 45 000 km of high-speed track and to create a 'high-speed rail economy' (ibid., p. 28). In this strategic vision, the conception is of a network of smaller cities within a short commute (say one hour) of the largest cities. By such means, a cap can be placed on the size of megacities, such as Shanghai, Beijing and Guangzhou, while achieving the benefits of urban agglomeration through the large, but not oversized, cities connected to the biggest, with bullet trains becoming like buses.



Source: Wikipedia.

Figure 1.1 China's eight-by-eight high-speed rail network

There is widespread admiration for China's infrastructure programme, as noted by Ansar et al. (2016, p. 1):

> The prevalent view in economics literature and policies derived from it is that a high level of infrastructure investment is a precursor to economic growth. China is especially held up as a model to emulate. Politicians in rich democracies display awe and envy of the scale of infrastructure Chinese leaders are able to build.

This viewpoint is challenged by those authors, who have undertaken what appears to be the first detailed ('micro') study of megaprojects in China, paralleling earlier analysis by Flyvbjerg and his various co-authors of megaprojects across the developed world, summarized in Grimsey and Lewis (2004c) and considered further in Chapter 9 in this volume.

Amongst the findings of Ansar et al. are that three-quarters of transport

projects in China came in over budget, and that two-thirds of roads have a low usage, with traffic volumes on average 41 per cent below forecast, and some routes receiving less than 20 per cent of their forecast traffic. The first result is perhaps not surprising in view of another finding in the study that, in terms of construction time and schedule overruns, China performed better than rich democracies: China taking on average 4.3 years to build road and rail projects vis-à-vis 6.9 years for the democracies. A general rule in engineering is that when a production schedule is accelerated – and building as quickly as possible was certainly the incentive in China – costs increase, and working faster does not save money (Kuprenas and Frederick, 2013).

Despite the Ansar et al. study being a first, and to this extent having a unique status, it must also be said that their analysis is a thin edifice upon which to base general conclusions about Chinese infrastructure projects. The study has two major defects. First, while described as 'large', the sample is relatively small and specialized. Due to data limitations, data are confined to 95 projects financed by the Asia Development Bank and the World Bank. Excluded from the analysis are the high-speed rail and urban rail networks, as well as the many projects internally financed. Second, while published in 2016, the study is largely historical. None of the 95 projects reviewed began in the decade since 2005, and more than 50 per cent of those examined commenced before 1991. Regrettably, both the narrowness of the data set and its dated nature are indicative of the difficulty of obtaining comprehensive statistics for China.

For 65 of the 95 projects, it was possible for Ansar et al. to map out the benefits-to-cost ratios, and on this score they estimated that 55 per cent of the projects had a benefit-to-cost ratio (BCR) lower than 1.0 and thus were economically unviable. However, *The Economist* (2017c) points out that there are two problems with this conclusion. First, with infrastructure projects such as roads, the costs are incurred earlier on, whereas the benefits accrue more slowly over time. In order to compare the two, it is necessary to discount the future economic gains for a net present value comparison. The higher the discount rate, the lower is the value put on future economic gains. Using a lower discount rate more in line with government borrowing costs alters the calculation considerably, putting the projects in a better light. Second, the authors' calculation of BCR 'are based on the assumption that the traffic volumes and toll revenues would not dramatically improve' (Ansar et al., p. 376). As *The Economist* (2017c, p. 30) notes, 'that is not always the case'. Indeed, the Yuanjiang–Mohei highway (known as Yuan-Mo), in the very south of China in Yunnan province, to which Ansar et al. devote considerable attention, in 2015 achieved traffic volumes 31 per cent higher than were projected back in 1999, and in the 2016 lunar new

year holiday the 147 km, four-lane road handled record numbers of vehicles (*The Economist*, 2017c). *The Economist*'s observation is that 'China's mega-projects are less wasteful than you think' (ibid., p. 28).

Nevertheless, it must be admitted that Ansar et al. are not alone in questioning the direction of China's infrastructure investment. Other critics – too numerous to mention – contend that China may have overextended itself by concentrating on 'showpiece' projects and constructing far-flung intercity high-speed rail lines and expressways, and countless bridges and roads to nowhere, while still lacking basic water and water treatment systems in many regions. Despite considerable construction activity, much financed by local government taxes, land concessions and Urban Development Investment Corporations (UDICs),[3] the 'build and they will come' philosophy has resulted in an undersupply of affordably priced housing units in many urban real estate markets, but empty buildings, a build-up in housing inventory and even 'ghost cities' in other areas mapped out for future development. Much pre-existing government housing is basic, for example lacking hot water, and greatly in need of renovation. Also, despite many technological innovations, there is the lack of a fully unified electrical grid (Urban Land Institute, 2013).

Even in terms of transport facilities, China's infrastructure push seems far from complete. China's high-speed lines have revolutionized the dynamics of travel in China along the country's east coast and from the east to key inland cities, but infrastructure investment falls short in other aspects. World Bank figures indicate that China is still in need of more roads and train tracks. China's road density of 40 km per 100 sq km in 2009 trailed the United States' 65 km per 100 sq km by a considerable margin. Although China is larger in area than the United States, its 98 000 km of rail lines in 2012 are less than half of the United States' 228 000 km (Murphy, 2013). Further, China has only 452 airports with paved runways, compared with more than 5000 in the United States and 700 in Brazil (Urban Land Institute, 2013). In a wider context, the simple fact is that China's capital stock remains a fraction of that of developed countries. For example, the research firm Dragonomics calculates that China's per capita capital stock in 2010 was 6–7 per cent of that in the United States (Orlik, 2011). The blanket assertion of many China 'bears' that China has somehow 'overinvested' in infrastructure does not seem to stand up to scrutiny.

As to empty roads – another point raised by Ansar et al. – perhaps the same might have been thought to be the case (and still seems to be so today, when travelling across Wyoming) when the interstate highway system was laid out in the United States in the 1950s (and still impressive today), so transforming the American economy through greater competition

(Samuelson, 1997). On the Presidential campaign trail, Eisenhower argued that 'a network of modern roads is as necessary to defense as it is to our national economy and personal safety' (cited in Klein, 2016, p. 151). In fact, the 1956 law that resulted was called the National System of Interstate and Defense Highways. Klein goes on to observe that Eisenhower's highways were part of a series of great infrastructure projects that helped to usher in unprecedented prosperity: 'Those projects generated economic growth and united the nation' (Klein, 2016, p. 151). Chinese officials would doubtless concur with the nation-building role attributed to transport and communications infrastructure.

China's 'clustering strategy' of building factories near nodes or terminals served by major transport routes, so presumably lowering the 'costs of moving goods over space' (Glaeser, 2010, p. 7), has proved 'hard to beat' for many industries (Urban Land Institute, 2013, p. 21). It is now being planned to extend this policy to create 'science cities' of the future. The first such 'smart city', the Tianfu New Area on the outskirts of Chengdu, capital of the western province of Sichuan (and 'mother' to the silk industry), is already under development. There is a planned station for a fast train connection to the east, another stop to connect to the subway in Chengdu, a planned convention centre and trade show building, a new hospital and, notably, government-supported working space for 'makers' – the Chinese description for young entrepreneurs. China accounts for 20 per cent of the world's total spending on research and development, but there is recognition that turning science into technology requires entrepreneurship (Callick, 2016b). When completed, the proposed city will comprise 400 000 to 500 000 people. Another 'smart city' is planned for Shenzen (Korporaal, 2016).

In comparison with these plans for new roads, fast trains, new mini-cities and development zones connected to China's major cities, recall by way of comparison the American Society of Civil Engineers Report Card on US infrastructure (Table 1.1). Much the same trend seems increasingly to be the case in Germany, the other traditional economic powerhouse (and still the third-largest economy in the world). An IMF study identified Germany as having neglected public infrastructure investment, especially in transport. Germany's net public infrastructure and investment has been negligible since 2003, and falls in the bottom quarter of 34 advanced and emerging economies of the Organisation for Economic Co-operation and Development (OECD) (Elekdag and Muir, 2015). Examples of this neglect come from the Kiel Canal – the world's busiest man-made waterway, which connects the North Sea and the Baltic Sea – which had to be partially closed in 2014 after two worn-out locks, built 100 years earlier in 1914, broke down. The German autobahns are crowded, and major bridges

crossing the River Rhine are so dilapidated that they have been off-limits for heavy lorries, while ordinary cars must slow down to 60 km per hour (Detter and Fölster, 2015, p. 186).

Against this backdrop of disregard of infrastructure maintenance in advanced countries such as the United States and Germany, the observation of Rowan Callick, China correspondent of *The Australian*, seems pertinent: 'Since the global financial crisis almost a decade ago, major north Asian cities have looked more modern than their Western counterparts: their infrastructure is more efficient and their inhabitants appear wealthier, are using more cutting-edge smartphones and other devices, and mostly are better dressed' (Callick, 2016a). His assessment underscores the calls noted earlier for infrastructure to be elevated as an economic priority in the 'old' and, in some eyes, 'stagnating' economies of the West. As an aside, not unrelated to Callick's observation, although it refers to another form of infrastructure, *The Economist* (2016b) points out that people who spend some time in China and get used to WeChat, the Chinese social media mobile operating service, 'complain that leaving WeChat behind is akin to stepping back in time' (ibid., p. 50). WeChat has been described as being there at every point of one's daily contact with the world, from morning until night, the leading app and hub for all internet activity including a cash payments system, offering features well in advance of any Silicon Valley-designed device which in comparison 'looks hopelessly backward' (ibid., p. 7).[4] On the basis of this and similar examples, *The Economist* concludes that 'The Western caricature of Chinese internet firms needs a reboot' (ibid., p. 7), for China is 'shaping the future of the mobile internet for consumers everywhere' (ibid., p. 50).

China's public infrastructure 'binge', investing 8.5 per cent of its GDP from 1992 to 2011 on infrastructure, more than any other country and well above the 2–4 per cent of GDP for other developing countries, may have paid dividends by laying the preconditions for growth. Yet, Ansar et al. (2016, p. 1) maintain that emulating such a massive infrastructure investment programme is not a viable development strategy for other developing countries which may use China as their model for economic development, citing Pakistan, Nigeria or Brazil. In the latter case, the authors are running contrary to other expert opinion. Most notably, a World Bank survey contended that making Latin America's infrastructure as good as East Asia's would raise its annual growth rates by as much as five percentage points in countries with the worst roads and telecommunications. For example, Brazil languishes in 107th place in the World Economic Forum's ranking of the quality of infrastructure, and Sharma (2012) argues that getting goods around the country is a 'nightmare', and when arriving at Santos (Brazil's largest port) trucks

must wait for days due to a shortage of warehouse space and automated cargo handlers.

India, clearly a future superpower (as it once was, and considering its palaces and cities, not only because of its population), initially took the opposite tack to China of investing heavily in rural roads. Since 2000, the Indian government has spent $21 billion in building or upgrading 290 000 miles of local roads, connecting 110 000 settlements in jungles or on mountainsides, with impressive results. As remote villages become better connected to the wider economy, more people are opening shops and small industries. New towns have sprouted to accommodate them. In fact, between 2001 and 2011, 2500 such new towns developed, enabling goods to be taken to market on paved roads. Now the emphasis has switched to cities and intercity connections, with 1700 miles of highways built in the 2015–16 financial year. At much the same time, 77 projects were launched in 2015 to widen and electrify 5800 miles of rail lines to relieve pressure on the railway system. In 2014, the number of passenger miles travelled on railways in India at 720 billion was the highest in the world, with China at 501 billion and Japan at 162 billion, second and third, respectively. Again, as in China, infrastructure in India is seen as the key to maintaining the economy's momentum (Zhong, 2016a, 2016b).

Yet, these are not universal rules. Not all infrastructure is value for money. It may serve political ends and be captured by cronyism. There is little point in building infrastructure if its usage is not priced correctly. India, for example, has relatively high rail cargo freight rates in order to keep passenger fares low, forcing goods onto already crowded roads (Zhong, 2016b). There may be unnecessary gold-plating and vanity projects, advanced by politicians, policy-makers and special interest groups. And there may be a 'knife edge' discontinuity with respect to network externalities. The full benefits of a communications or rail network may not be realized until the network is completed and a near universal service is provided (Röller and Waveman, 2001). However, once the basic infrastructure network is laid down and adequately maintained, extra new investment may quickly run into diminishing returns.

However, at this juncture we have run well ahead of ourselves. What exactly is infrastructure? China is being accused of dumping excess infrastructure in the form of steel production onto world markets (Talley, 2016); but is steel production infrastructure or an associated product? Our focus in this volume is with public infrastructure; but what distinguishes public from private infrastructure? Many activities that used to be government owned or supplied are no longer so. Private mining companies in Australia and elsewhere operate infrastructure: they build and own ports, and the roads and railway lines that transport the products to those ports. Nuclear

power stations are designed, financed, built and operated by private entities. Is there a clear line between public and private? In many cases, public and private coexist, as with hospitals and other health facilities. Building private health infrastructure, once the planning permissions are obtained, is largely a private matter, and so is maintaining and operating it so long as there is adherence to health and other regulations. That is not the case with a public hospital, since taxpayers rather than shareholders foot the bill. Is the public infrastructure being procured in a cost-effective manner, and how well is it operated? Despite being public, private sector firms are involved in both the acquisition and operation; but to what extent, in what form and in what ways? These are questions taken up in later chapters, but for the present they lead us to a major sub-question of our analysis.

INFRASTRUCTURE PROVISION

As set out in Box 1.1, there are a large number of ways of procuring public infrastructure. With the exception of the government agency supplying the infrastructure itself (which is rare these days), all involve some degree of private sector involvement in design, construction, finance, operation and maintenance, and the table is arranged in descending order from low to high private participation. Despite the seeming complexity, this veritable 'alphabet soup' of acronyms can be grouped into three basic approaches. First, there is traditional procurement and its variants (construction only, through to managing contractor and perhaps alliancing) listed at the top of the table. At the other extreme, there is privatization, either for limited periods (leasing, franchise, concessions) or with an outright sale in which case ownership and control of the assets pass entirely into private hands, although there may be regulation if the privatized entity has a monopoly of the market. The latter approach forms the basis of the regulatory asset base (RAB) model of infrastructure (Makovšek and Veryard, 2016). In between these two groupings lie the various manifestations of public–private partnerships (PPPs).

The different types of PPPs make it difficult to offer an overarching definition of a PPP. But whereas traditional procurement utilizes the private sector contractually for a limited purpose and time, while privatization delegates responsibility to private entities on a permanent basis, the PPP involves a long-term contractual relationship for a defined period enabling the project to be designed, financed, built and privately operated and maintained or various combinations thereof, before reverting eventually to government control (except in the case of BOO).

Traditional procurement of public infrastructure has been the method

BOX 1.1 THE 'ALPHABET SOUP' OF INFRASTRUCTURE PUBLIC–PRIVATE BUSINESS MODELS

Traditional Approaches

- Public provision and supply of collective goods.
- Service provision contracts.
- Outsourcing/contracting.
- Construct only.
- Design and construct (D&C).
- Design, bid, build (DBB).
- Design, construct, maintain (DCM).
- Operate and maintain (O&M).
- Operate, maintain and manage (OM&M).
- Managing contractor.
- Alliance contracting.

Public–Private Partnership Variants

- Build, transfer, operate (BTO).
- Build, operate, transfer (BOT).
- Build, lease, transfer (BLT).
- Build, lease, transfer, maintain (BLTM).
- Build, own, operate, remove (BOOR).
- Build, own, operate, transfer (BOOT).
- Lease, renovate, operate, transfer (LROT).
- Design, build, operate, maintain (DBOM).
- Design, build, finance, operate (DBFO).
- Design, construct, maintain, finance (DCMF).
- Design, build, finance, maintain (DBFM).
- Design, build, finance, operate, maintain (DBFOM).
- Build, own, operate (BOO).

Regulatory Asset Base (RAB) Approaches

- Lease.
- Franchise.
- Concession.
- Joint venture (JV).
- RAB model for distinct assets.
- Corporatization.
- Outright privatization.

Source: Based, with extensions, on Grimsey and Lewis (2004c).

conventionally employed and the norm since the end of the nineteenth century, and still accounts for the great bulk of infrastructure procurement. Privatization came into vogue in the 1980s and 1990s under US President Reagan and United Kingdom Prime Minister Thatcher on ideological and efficiency grounds, and is popular again as a financing tool in 'asset recycling', whereby the sale of existing infrastructure assets (under an appropriate regulatory regime) generates resources for the acquisition of new ones as a way of avoiding extra debt. PPPs are an old idea (dating back to Roman times), revived in the 1990s. Very much the poor cousin of the three approaches, at least in dollar terms, the controversies that they generate – especially in advanced countries – greatly exceed their economic footprint.

When our two earlier volumes were published (Grimsey and Lewis, 2004c, 2005a), PPPs were still a relatively new phenomenon, and we sought to explain their intellectual origins, how they are structured differently from traditional procurement, and what it was hoped that they would bring to the infrastructure scene. With the elapsing of time, and the experience gained, it is appropriate to look again, and to take stock of where matters stand today. This subtext introduces a further question to add to those posed earlier in this chapter about infrastructure generally: have PPPs lived up to their promise?

It is fair to say that there have been strong critics of PPPs from their very inception (indeed, conception) and it is not easy for us to understand why this is the case. Certainly there are large numbers in society who believe that government services should be 'free' (in Australia and Britain, the cry is 'let the rich pay'). There is resistance to the payment of tolls on PPP roads, and considerable unease about the involvement of for-profit enterprises in the provision of public services such as hospitals and other social infrastructure, particularly from public sector unions. Even the private enterprise-friendly United States baulks at the use of PPPs and availability payments for social infrastructure. Much the same opposition occurred when outsourcing and privatization first surfaced. Perhaps, with the battles for outsourcing and privatization seemingly lost or in abeyance, PPPs represent the last bastion. Hence, the implacable opposition in some circles. Also, PPPs are seen, incorrectly in our view, as privatization in another guise.

Admittedly, PPPs are an easy target for criticism. Tendering costs are frequently considered too high. The transparent pricing of risk draws focus on returns generated. Attention is too often focused on those projects where risk is successfully managed by the private sector and can seem to provide an opportunity for private sector organizations to earn generous returns; a feature which many observers find objectionable in the current

environment of rising inequality. To the ordinary taxpayer, who may not appreciate the myriad of issues and difficulties involved in procuring complex infrastructure, it can appear that too much is being paid to consultants of various sorts – a necessity on most procurement models, and not just PPP. Critics of the PPP model also take ammunition from the projects that have performed poorly or even failed – if not in reality, then in the public perception – and these failures (some spectacular, like the London Underground PPP) often receive far more attention than the many successes. In such a climate, it is incumbent on governments (and the private sector) to demonstrate that PPPs continue to offer positive outcomes for the community and value for money for the taxpayer. This seems to us a valid position. There needs to be greater candour and less gilding of the lily on what PPPs can and cannot do.

While recognizing these concerns, it is important at the same time not to lose sight of the fact that PPPs came into existence in large part because of dissatisfaction with traditional procurement methods and cost blowouts and time overruns. In the face of some PPPs that exhibit similar characteristics, maybe the real lesson is that infrastructure is inherently complex, and its provision problematical, however procured, so that considerably greater effort needs to be devoted to how projects are designed and selected, as well as determining what particular model is chosen for their delivery.

Basically, the case for continuing to consider the use of PPPs today is essentially the same as that when they were first contemplated, and rests almost entirely on efficiency gains and value for money for taxpayers and users (depending on the model used). The core elements of risk allocation, focus on long-term whole-of-life outcomes and a focus on outputs, and a correct alignment of incentives continue to underpin the model. Moreover, the PPP model has always had to overcome a substantial hurdle. Government managers at all levels assume their own cost of capital to be much lower than that of the private sector. In order for a PPP to be chosen and succeed, private sector efficiency gains need to be large enough to overcome the higher borrowing costs of private finance, which provides a considerable challenge for the full DBFOM model. We use the word 'assume' because the question of whether public sector borrowing costs are 'really' lower is one that has resurfaced, almost out of the blue, in recent literature (Moszoro, 2016; Geddes and Goldman, 2015).

This unfavourable (and perhaps unfair) comparison is an issue which strikes at the heart of a PPP. What distinguishes a PPP is bundling, that is, the combining of activities that would be the subject of separate contractual arrangements under traditional procurement. One particular PPP variant has come to dominate the landscape, especially in Britain and Australia, namely the design, build, finance, operate, maintain (DBFOM)

approach. But what happens if one or more of the elements of the bundle is removed, in particular if, because of the lower cost of public sector borrowing, the F is taken out to make a DBOM or DBO? It used to be argued that because financing of the project is private, it is subject to market disciplines, leading to efficiency gains. Do the same incentives operate if the model is no longer subject to the discipline of financial markets and, instead, government provides the finance? What does a PPP then offer?

There is the further question of why in the first place a procuring authority would agree to having the various functions bundled. Why would a government body wish to tie its hands in this way, rather than opt for the flexibility of separate contracts, which would allow it to respond more readily to future contingencies without costly renegotiations? The question is heightened when it is appreciated that the special-purpose vehicle (SPV) set up for the project will itself enter into a separate contract for design, or design and build, with a construction company, a financing arrangement with senior lenders, and an operations and maintenance contract with a facilities management company. Why is it presumed that the SPV company can contract more cheaply or effectively with the other parties than can the government body? Such questions are explored in later chapters. First, however, we begin with an examination of infrastructure.

NOTES

1. According to the Transport Research and Innovation Portal (TRIP), a transport research group, potholes and poor road conditions cost the average US driver $516 a year in repairs and wasted fuel (Derousseau, 2016).
2. The United States has 730 km, but as 'high speed' the system hardly counts. Amtrak's Acela Express between Boston and Washington only occasionally hits 150 miles per hour and averages 68 mph due to having to negotiate hazards such as Baltimore's tunnel built just after the Civil War where trains come to a crawl, and the two-track Susquehanna River Rail Bridge between Baltimore and Wilmington, DE. Shanghai's Maglev Train hits 268 mph and usually averages 143 mph (Dumaine, 2015).
3. UDICs are treated as municipal corporations under company law, and although mostly controlled by municipal governments, the law does not clarify the relationship between UDICs and local government, especially with respect to financial liability with the rapid build-up in debt from UDICs' borrowings (Technical Assistance Report, 2016).
4. WeChat combines messaging, voice calls, browsing, gaming and payments, and can be used for everything from paying parking tickets, making a hospital appointment, ordering food, paying for a cup of coffee, splitting restaurant bills with friends, to booking foreign holidays, all within the WeChat universe.