1.0. Introduction

Infrastructure is the foundation for economic and social development and is often considered to be a key economic growth driver for cities. It provides the underpinning for practically all contemporary economic activity, and constitutes a major economic sector in its own right, integrating and contributing significantly to raising living standards and the quality of life (Stevens et al, 2006). Infrastructure therefore influence or constrain in significant ways the economic and growth potentials of any country. What holds communities together are not just propinquity, social interactions, and business transactions but also the joint consumption and enjoyment of public infrastructure (which are non-divisible and non-excludable). Organizing human activity in urban settlements requires investment in fixed assets, such as transportation, telecommunications, electricity and water. However, the gap between infrastructure needs and investment has continued to widen, while the quest for the means to fund infrastructure has assumed additional urgency (Leavitt et al, 2008). There is an increasing awareness of the necessity to devise new methods of financing infrastructure, the scrutiny of which is central to this book.

Infrastructure has acquired increased investment significance with capital flows from institutional investors seeking exposure to alternative assets for enhanced performance and diversification benefits. Previously, the asset allocation for infrastructure by many institutional investors and superannuation funds was seen as part of their property allocation. However, there has been significant growth and maturity in the infrastructure sector; such that it is now considered to be a property-related, but separate asset class. As a result, many institutional investors and superannuation funds now have a unique and separate asset allocation to infrastructure and the infrastructure sub-sectors (Peng and Newell, 2007).

Also, **t**he search for innovative vehicles in financing infrastructure has become incessant as the demand pressure and the plethora of evidences observed in the form of increasing infrastructure gap financing, ageing infrastructure, environmental factors, such as climate change, rising quality standards are factors attracting institutional and private sector participation in infrastructure investment. Other infrastructure financing lacuna includes government fiscal budgetary constraints and historical underinvestment in crucial infrastructure projects. These are drivers compelling the emergence of key institutional

players such as pension funds, private equity funds, hedge funds, mutual funds and the most recent and ubiquitous sovereign wealth funds.

Merna and Njiru (2002) point out that this financing gap and the growing realization of the limitations of public funding for infrastructure development has been an issue since the 1980s. These constraints tend to render the conventional means of financing infrastructure inadequate as most governments from both developed and developing countries are confronted with the challenge of meeting up with or increasing infrastructure needs and the obvious financing gap, clearly indicating the need for a more cognizant development of adequate financing structures for the provision of infrastructure. Accordingly, recognition of this funding gap has consequently attracted a universal acceptance of a larger role of institutional investors in the financing of infrastructure.

Economic growth tends to be central to the search for an alternative mode of financing infrastructure and the huge fiscal deficit of government budgets across the globe will provide an opportunity to rethink partnerships. With the drive towards the privatization of most government public assets, Kim (1997) highlights that the capacity of a sector is judged by its ability to adequately provide finance since the efficiency of the financing vehicle determines to a large extent the performance and the scope of expansion for a given project. As a result, adequate financing mechanisms for urban infrastructure, its operation and maintenance is a precondition in ensuring that cities function effectively and efficiently too as the engines of growth.

The choice of infrastructure financing mechanism and the optimal investment strategies for potential returns tend to be influenced by the inclination to offer paramount value for money and the nature of risk associated with a given infrastructure investment mechanism. In addition, the nature of the financial landscape, especially in a financial crisis has further reinforced and necessitated the significance of looking beyond the present infrastructure need, to a more sustained infrastructure financing blueprint and more innovative financing vehicles.

This book therefore investigates the potentials of capital markets and institutional investors in bridging the global infrastructure funding gap.

1.1. Definition and Classification of Infrastructure

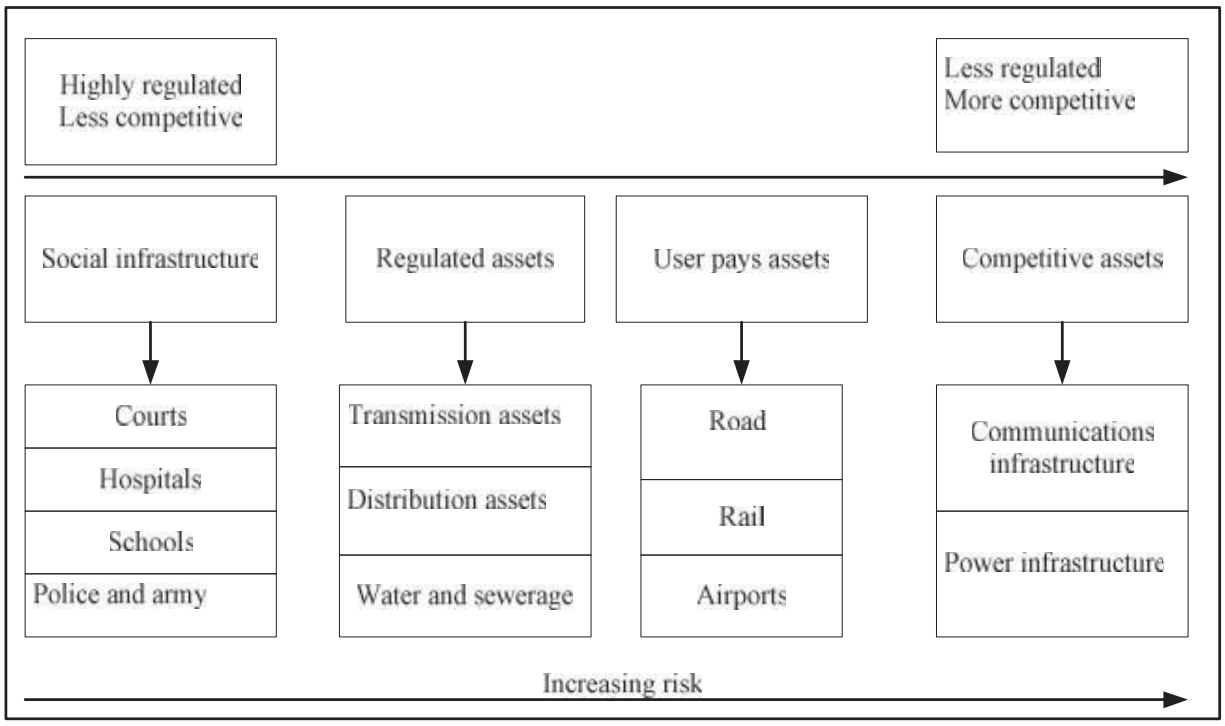
The term ‘infrastructure’ is not a new concept and is increasingly becoming more widely used in various fields cutting across disciplines (economics, information technology) and sectors (government, military, academia and institutional investors). Finding a succinct definition and classification for infrastructure is important in enhancing the understanding of the dynamics of infrastructure as an asset class and the differences between types of infrastructure not only for investment purposes but also for policy making (Moteff et al, 2003). According to Baldwin and Dixon (2008) a definition of infrastructure must be consistent, across jurisdictions and over time, in order to be useful, however Grimsey and Lewis (2002) consider that it is easier to recognise than define.

From a public policy standpoint, Moteff and Parfomak (2004) consider that the definition of infrastructure has been progressive but often indistinct. Twenty five years ago infrastructure was defined primarily in debates about the satisfaction of the public works—which were viewed basically as deteriorating, obsolete and of insufficient capacity. According to Jacobson and Tarr (1995) infrastructure can be viewed as the structures and networks that surround and connect urban areas and underpin social and economic activities. Infrastructure resources are considered vital and crucial, either because they support economic growth, as in the case of transport infrastructure and utilities such as gas, electricity and water, or because they fulfill social needs, such as schools, health care facilities, jails and recreation facilities (Timotijevic, 2008). From an economic perspective, infrastructure as an analytic concept has been virtually absent from the economist’s parlance (Prud’homme, 2005) with infrastructure generally referred to as social capital either in the form of permanent physical installation and mechanisms, facilities supporting social-economic activities in a community, region, or nation, or human capital in the form of intellectual concepts, theories, skills, and organisation or institutional components (Hite, 1989). Infrastructure assets therefore represent a broad mix of businesses that provide essential services to society (Standard & Poor’s, 2007).

According to Parker (2008) and RREEF (2005) infrastructure stocks have traditionally been divided into two broad categories: social and economic infrastructures. The social infrastructure comprises education, public healthcare and correctional facilities. These assets are often financed as public / private partnerships. Economic infrastructure consists of assets that support commerce and for which a fee is typically charged, examples include utilities, toll

roads, airports, pipelines, power stations and wind farms. Closely related to economic infrastructure is engineering infrastructure which according to ABS (2001) is a section of engineering construction that comprises all transportation systems including bridges, harbours, water storage and supply, sewerage and drainage, electrical generation, transmission and distribution, pipelines, recreation and telecommunications. Timotijevic (2008) further classified infrastructure into utility and non-utility infrastructures. Utility infrastructure such as electricity, water and gas provide essential services to communities but subject to strict regulation by government-related entities. As a result, utilities have a high level of regulatory risk (Figure 1). Indeed, there tend to be a correlation between regulation and risk, the less competitive assets such as the utilities are highly regulated and less risky while the more competitive assets are less regulated but incur higher risk factors.

Figure 1 Correlation between regulation and risk



Source: Rickards (2008)

However, a balance is sought by the regulatory bodies/entities between consumer satisfaction with respect to quality of service received and investors expected economic returns and stability. As a result of this perceived stability, these utility assets typically carry a higher level of gearing than the other infrastructure assets. Non-utility infrastructure assets include social infrastructure and economic infrastructures such as transportation infrastructures (toll

roads, airports, ports and rail) and communication infrastructure and while there are controls on price increases, these assets can generate surplus returns through increased volume growth. As a result, they are leveraged to the economic cycle and feature patronage risk with respect to level of benefit to consumers (Timotijevic, 2008). Frischmann (2005) construes infrastructure as either traditional or non-traditional. Traditional infrastructures refer to physical resource systems made by humans for public consumption including but not limited to transportation systems, communication systems, governance systems and basic public services and facilities, such as schools, sewers, and water systems. In contrast, other resources that have the potential to significantly influence economic and social gains such as environmental resources, information resources, and internet resources are classified as non-traditional infrastructures.

As an asset class, infrastructure is not homogeneous but can be generally encapsulated in four sub-categories PH&N (2007):

1. User-pay assets: as the name suggests, these are assets for which users are willing to pay a fee, such as toll roads. A key benefit in this category is the stability of the associated revenue stream since these assets are often used on a regular basis with very inelastic demand.
2. Contracted assets: tend to be privately held and are often operated via a long-term contract with a government, for example, a power generation plant.
3. Regulated assets: provide essential services such as water. Regulated prices are often linked to underlying costs and feature regular rate increases. 4. Social assets: include schools, hospitals and courthouses. These are politically very hard to privatize and consequently the model for ownership/operation is usually a public sector-private sector partnership, known as P3 (PH&N, 2007).

From the foregoing discussion, infrastructure resources can be evaluated from two distinct perspectives; in terms of the services derived from the physical facilities and the physical facility itself (Fox, 1994).

Frischmann (2005) further classifies infrastructure based on the nature of the distribution of downstream activities into three general groups: commercial, public, and social infrastructure (Table 1). This classification demonstrates that certain non-traditional infrastructure such as

the internet span commercial, public, and social infrastructures and are referred to as mixed infrastructure while those and those that fall within only one category are considered as pure infrastructure.

Table 1 Typology of Infrastructure Assets

Type	Definition	Examples
Commercial Infrastructure	Non-rival or partially (non) rival input into the production of a wide variance of private goods	1. Basic manufacturing 2. processes 3. Cable television 4. The Internet 5. Road system
Public Infrastructure	Non-rival or partially (non) rival input into the production of a wide variance of public goods	1. Basic research 2. Ideas 3. The Internet
Social Infrastructure	Non-rival or partially (non) rival input into the production of a wide variance of non-market goods	1. Lakes 2. The Internet 3. Road systems 4. Schools/Governance systems

Source: Frischmann (2005)

Buhr (2003) considers that infrastructure represents capital goods in the form of roads, ports, airports, rail, education, and health facilities, equipment of energy and water provision, facilities for sewage, waste management, and air purification, building and housing stock, facilities for administrative purposes and for the conservation of natural resources. Buhr (2003) refers to these infrastructures as material infrastructure; they are also referred to as social overhead capital, social amenities, or public facilities due to the public nature of their provision.

Defining infrastructure from a holistic viewpoint only aggravates the ambiguity, as Jerome (2008) posits there is no irrefutable definition of infrastructure. It is most commonly conferred in terms of its characteristics – longevity, scale, inflexibility and higher investment costs – but that is rarely seen as appropriate. Increasingly, its meaning has been shifting from one focusing on physical fixed assets to softer types of infrastructure such as information systems and knowledge bases. Increasingly society is dependent on the smooth operation of a growing range of infrastructure services, though infrastructure is not an end in itself, their quality and

provision guarantees the delivery of essential services that enhances economic growth and contributes to the quality of life, including social well-being, health and safety of citizens, the value of locality and environmental quality (OECD, 2008). Infrastructure is built to facilitate and establish a flow of services, which according to CIDA (2001) must be economically viable and equitably accessed by all levels of society. The quality of infrastructure services significantly expands economic potential and empowers societies to improve living standards, efficiently advancing sustainable growth and expansion.

From an investment viewpoint, infrastructure can be classified based on size and stage of development. According to Williams (2009) the smallest threshold for most infrastructure funds is approximately $50 million but the maximum that can be greater than $10 bn, with the possibility of involving a consortium of investors. Based on stage of development, EnnisKnupp (2008) classified infrastructure into greenfield, rehabilitated brownfield and brownfield infrastructures. Greenfield infrastructure investments refer to investments in projects that do not currently exist and need to be constructed. These assets typically involve more risk than pure brownfield investments as they include design and construction risk, as well as operating risk. These types of investments are often sold to other investors once the project is completed and generating cash flow. Rehabilitated brownfield is a segment of the infrastructure industry which focuses on investing in assets that are currently constructed but may require immediate capital improvements or expansion. This structure is effectively a blend of brownfield and greenfield risks and returns.

Brownfield infrastructures, commonly referred to as core infrastructure investments (Williams, 2009), are investments in generally well established cash-flowing projects with developed assets and structures that may be approaching their most significant growth potential. Brownfield assets are perceived to be the lowest return and lowest risk sector of infrastructure investing. Profit margins of brownfield projects tend to be low, as the cost of purchasing and operating the asset are collectively higher than greenfield investments with less room for capital appreciation (EnnisKnupp, 2008).

1.2. Significance and Economic Competitive Attraction of Infrastructure

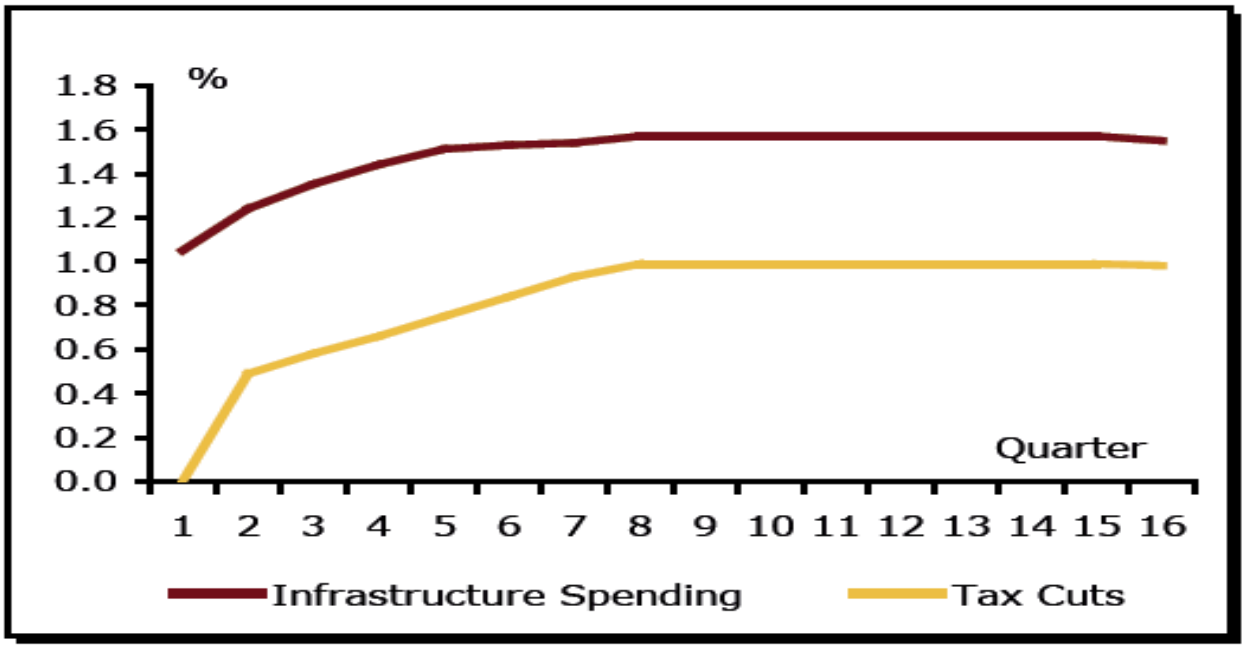
Extensive and efficient infrastructure is an essential driver of competitiveness (World Economic Forum, 2008). The entire life cycle of infrastructure, whether social or economic, existing or new, generally have significant effect on economic growth, from their creation, through their upgrading and maintenance and most outstandingly by their use (Sharma, 2006). As a result, infrastructure represents an important source of economic empowerment and revenue supplies to any government. Existing infrastructure affects current and future revenue requirements through the repayment of existing principal and interest on any financing that was used to acquire the infrastructure; costs associated with the use of the infrastructure such as power, labour and ancillary equipment; the related ongoing maintenance costs; and considerations for its future replacement (CICA and PSAB, 1999).

The significance of infrastructure quality and quantity is recognized across households, companies and governments. The services generated from infrastructure assets are usually consumed by both households and enterprises. Infrastructure is both a final consumption item and an intermediate consumption item that enhances welfare and increases output (Prud'homme, 2005). For instance, better transportation services that reduce travel costs and time, and more accessible water that reduce collection time, can allow households the opportunity to devote more time to income-earning activities (Fox, 1994). Beyond enhancing earning capacity and quality of life for the low income, adequate infrastructure is a means of enhancing productivity and growth of firms; it is apparent that it plays a central role in generating external effects that fundamentally alter the capacity of the economy to produce goods and services (Rodríguez, 2006). Lakshmanan et al. (1985) conjecture that infrastructure provides basic services without which most primary, secondary or service activities can operate effectively.

Quality infrastructures provide key economic services efficiently and improve the economy's competitiveness among nations (Newell and Peng, 2007). It therefore reflects a vital means of fostering economic growth and expansion compared to other factors such as tax cuts. Tal (2009) noted that spending on infrastructure is a better economic multiplier than tax cuts, evidenced by increased job opportunities. For instance, in the US, the impact of economic growth of infrastructure spending worth 1% of GDP (Figure 2) is more than double the impact of tax cuts and in Canada, $10 bn of infrastructure spending can potentially create 110,000

jobs and lift economic growth by close to 1.5 percentage points—well above the stimulus effect of a tax cut of a similar size (Tal, 2009).

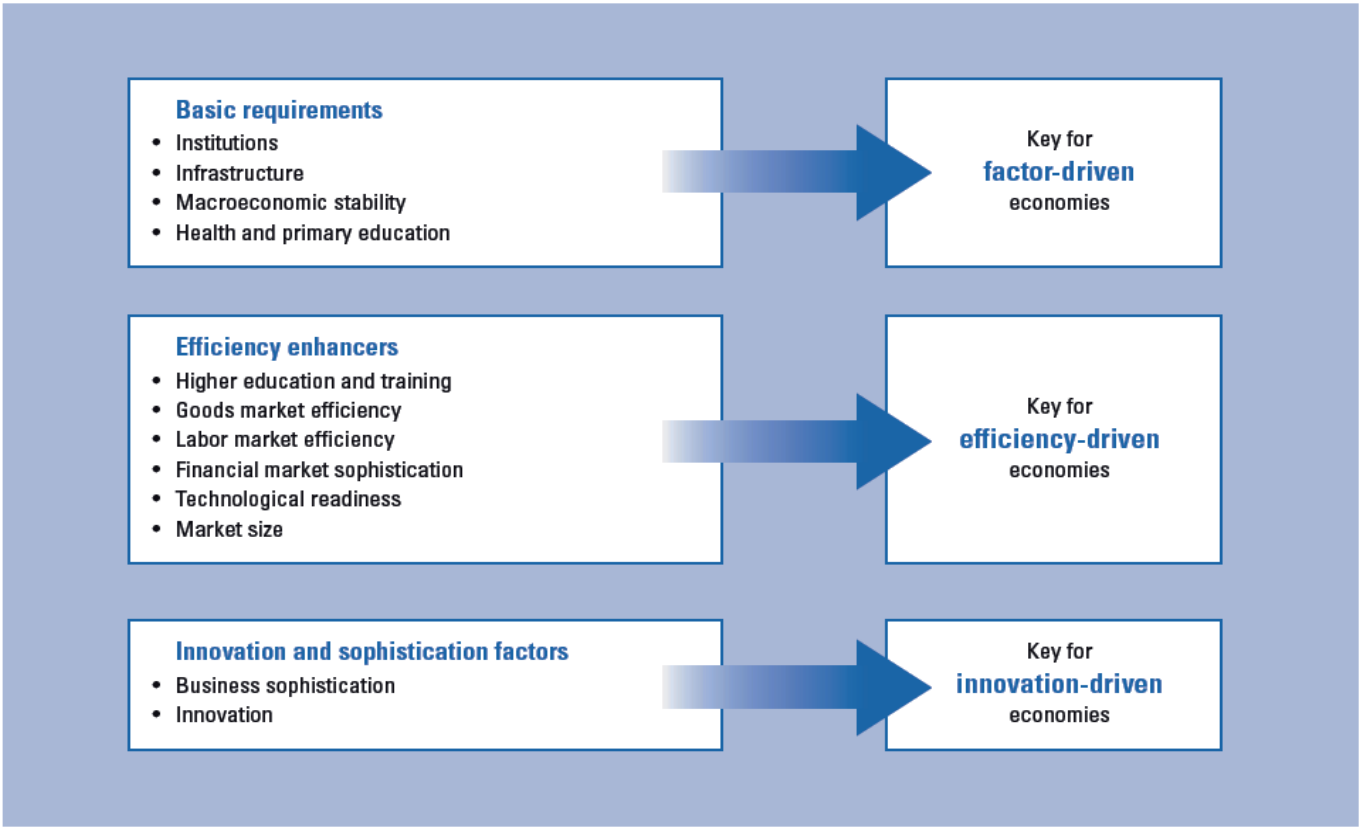
Figure 2 Output Effects of a Stimulus of 1% of GDP (US)



Source: USCBO, CIBCWM A and Tal B. (2009)

At a more global scale, the economic importance of infrastructure has been the subject of extensive research since the late 1980s (Finkenzeller and Dechant, 2009). Impelled by the mounting pressure associated with increasing demand for infrastructure coupled with the growing significance of infrastructure, the World Economic Forum (2008) has been committed to an annual Global Competitiveness Report (GCR) reflecting on infrastructure and other pillars (Figure 3) of economic growth and competitiveness. The report lists infrastructure as one of the key drivers of a country's economic attractiveness and competitiveness, next only to institutional framework.

Figure 3 The 12 Pillars of Economic Competitiveness



Source: The Global Competitiveness Report 2008-2009 © 2008 World Economic Forum

There is convincing evidence underpinning the significance of quality infrastructure in a country's economic positioning, for instance, Canada was promoted from 13th position because of its transport and telecommunications infrastructure, while France rose to 16th attracting credit for having the second best infrastructure in the world (Kennedy 2008). The question of sustainability becomes eminent as infrastructure will continue to play a vital role in economic and social development, not only because the system of infrastructure network of an economy is becoming increasingly important, but also society is ever more dependent on the smooth running of a growing range of infrastructure services (OECD Policy Brief, 2008).