2.1 THE SETTING

2.1.1 Background

This Chapter begins by briefly discussing the role that infrastructure plays in economic development and the impact it can have on growth. It first provides a definition of the word “infrastructure”, discusses how infrastructure supports economic growth, and then reviews the current status of infrastructure in Zimbabwe. It concludes with an assessment of the major challenges associated with the further development of the country’s infrastructure in the decade ahead.

2.1.2 What is Infrastructure?

The usage of the word “infrastructure” has evolved quickly in the past two to three decades, especially between the 1980s and 1990s. According to Wikipedia, infrastructure is now widely defined “as the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function”. Wikipedia further states that the term typically refers to the technical structures that support a society, such as roads, water supply, sewers, power grids, and telecommunications. Viewed functionally, infrastructure facilitates the production of goods and services.

The focus of this Report is limited to economic infrastructure, which is economy’s capital stock that produces services to facilitate economic production or serves as inputs to production. The economic infrastructure refers to assets held in transportation services, electricity, water and sanitation, and telecommunications sectors. The Report gives particular attention to three aspects of economic infrastructure: (i) the role of public utilities and the private sector in creating and maintaining the infrastructure; (ii) the extent to which these infrastructure assets promote productive economic activity by the business community and households, and provide basic services for the nation as a whole; and (iii) the extent to which the provision of these services is efficient and reliable, which is critical to unlocking bottlenecks, improving productivity and competitiveness, and achieving sustained economic development in Zimbabwe.

Another dimension of infrastructure not covered in this Report is social infrastructure, which provides services, such as health, education and recreation, and has both a direct and an indirect impact on the quality of life. Directly, it increases economic activity and employment creation, and indirectly, it enhances broader developmental outcomes. There are strong linkages between the economic and social dimensions infrastructure services; for example, ICT also facilitates investment in human capital by using some of the economy’s physical capital stock to raise productivity of the workforce. The impact on growth is similar to an increase in the supply of capital; a higher capital-to-labor ratio enables a given number of workers to produce more per capita.

2.1.3 The Impact of Infrastructure on Growth

The amount and quality of a nation’s economic infrastructure has an important bearing on economic growth in both the medium- and longer-term. It is often viewed as the wheels of economic activity since it provides the environment for productive activities to take place and facilitates the generation of growth. Box 2.1 provides a brief review of the findings of various studies and reports that have found a positive association between infrastructure and a country’s growth.
The impact of infrastructure on long-run economic growth has been studied extensively. The basic theoretical framework of the impact of public capital on economic growth was developed first by Arrow and Kurz (1970). Based on this framework, the endogenous growth literature shows that an increase in the stock of public capital can raise the steady state growth rate of output per capita, with permanent growth effects (Barro 1990, 1991, and Barro and Sala-i-Martin, 1992). Other studies focus on the differential impact of capital and current components of public spending on growth (Devarajan et al., 1996), showing a positive effect from capital expenditures and often negative effects from current or consumption expenditures.


Most of the literature finds a positive impact on the relationship between infrastructure and output, growth, or productivity. However, the results largely depend on the measures of infrastructure employed in the analysis. The empirical literature uses various measures of infrastructure, such as physical units of infrastructure, stocks of public capital, and infrastructure spending flows. Some studies use the indices of infrastructure as proxy for infrastructure.


The results are less conclusive when infrastructure spending flows are used as proxies for infrastructure. Straub (2008) claims that the positive effect of infrastructure on growth is often obtained when physical indicators of infrastructure are used. The results are not so clear when infrastructure spending flows are used as proxies for infrastructure. This might be due to the fact that political and institutional factors (i.e. inefficient government, not the level of infrastructure investment) often affect the level of infrastructure stocks.

The common argument is that a large increase in public spending in infrastructure services may have a strong growth-promoting effect. Conventional channels that macroeconomists normally emphasize through which public infrastructure may affect growth relate to: (i) a direct productivity effect whereby a higher stock of public capital in infrastructure tends to raise the productivity of other inputs, such as labor and the stock of private capital, thereby reducing unit costs; and (ii) complementarity effect whereby public infrastructure increases marginal productivity of private inputs and, in so doing, raises the perceived rate of return on physical capital by the private sector. In addition to these effects, several other channels have been identified by new research, including the indirect effect on labor productivity, effect on the durability of private capital, and impact on the social sectors (education and health). Cross-country analysis by Leipziger, (2005) has indicated that there is a direct correlation between infrastructure accumulation and growth, as measured by improvements in GDP per worker and growth in infrastructure stocks per worker. Conversely, comparative analysis of Latin America and Asia has shown that under-investment in infrastructure has serious consequences for growth and competitiveness, particularly when inventory holding costs are taken into account. These

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studies suggest that the availability or absence of the “right” infrastructure often influences the decisions of producers and consumers about where to live or work, whether to produce and what to produce. This, in turn, affects the ability of the economy as a whole to adjust to changes and external shocks.

2.2 STATUS OF INFRASTRUCTURE AND SERVICES IN ZIMBABWE

2.2.1 The Setting

Zimbabwe is a landlocked country with an area of about 391,000 square kilometers and a population of almost 13 million. Agriculture and mining and their related industries, as well as Zimbabwe’s geographic location, are the main factors that have had a profound influence on the spatial and modal development of the transport system in Zimbabwe. This situation is not likely to change in the near future. Prior to the economic difficulties experienced in the past decade, Zimbabwe’s economy was mainly agrarian, backed by a strong commercial farming sector. Maize was the country’s largest crop, while tobacco was the largest export crop, followed by cotton. The country is endowed with a wide variety of mineral resources, and there is extensive mining of coal, gold, platinum, copper, nickel, tin, clay, chromite ore, and iron ore. Among Zimbabwe’s industrial products are steel, wood products, chemicals, fertilizer, clothing and footwear, foodstuffs, and beverages.

Much of the country lies on a high plateau with the central plateau forming a watershed between the Zambezi and Limpopo river systems. The Limpopo and the lower Zambezi valleys are broad and relatively flat plains. The eastern end of the watershed terminates in a north-south mountain spine, the Eastern Highlands, which have some of the most productive agricultural areas of the country. The northwest portion of the country consists mainly of plateaus interspersed with giant granite outcrops. The southern portion of the country consists of the level savannah that drains into the Limpopo River.

2.2.2 Transport

The three main transport modes that serve the Zimbabwean economy are roads, railways, and aviation. Inland water transport is limited and takes place mainly in man-made water bodies such as Lake Kariba. Zimbabwe’s road network was once considered among the best in Africa and it was a significant contributor to the growth of the Zimbabwe economy. The provision and upkeep of the network was backed by intensive research, good experience, and the existence of appropriate technical standards and skills in the country. The railway network connects Zimbabwe with all its four neighbors and beyond. It is a major factor in trade and economic growth within the region. Within Zimbabwe, it connects all major mining areas, heavy industrial centers as well as the major agricultural collection centers and provides much of the transport of mineral exports to seaports in Southern Africa. The use of rail for the transport of freight also improves road safety and reduces road damage and congestion. The aviation industry provides international and local air transportation links, with Harare International airport as the main hub. The other important airports are Joshua Nkomo International Airport in Bulawayo, Victoria Falls, and Buffalo Range. In addition more than 200 airports and aerodromes of diverse standards and capacity are scattered throughout the country. The airports are particularly important for the country’s tourism industry. Air transport also provides essential services to the mining industry in Zimbabwe with links between Harare and the major mining provinces.

The Government is a signatory to a number of SADC protocols that have implications for the design and implementation of infrastructure policy and programs within Zimbabwe.
Most of these protocols were established in the 1990s. Action was taken on a number of policy fronts in the years immediately after the protocols were signed, but in the past decade there has been very limited further policy reform. The SADC Protocol on Transport, Communications, and Meteorology (1996) is a regional protocol that committed all SADC member states to compliance with its requirements by 2010. In the case of the transport sector no published policy document covers the overall transport sector in Zimbabwe. However, two important draft policy documents present the Government’s long-term approach to the management of the sector: the “Road Sub-sector Policy Green Paper” of March 1999 and “Draft National Transport Policy” of September 2005 that sought to align national transport policy with regional initiatives such as the SADC Protocol on Transport, Communication, and Meteorology, and national policies such as “the Zimbabwe Millennium Development Goals (MDGs) and the Macro Economic Policy Framework 2005-2006.” The purpose of the Draft National Transport Policy was to promote “long-term sustainable development in the transport sector.”
2.2.3 Electric Power

The availability of electric power is a basic requirement for all Zimbabweans. Power supplies underpin all other services, and there is undeniable evidence that the development of reliable, adequate, low priced power can contribute significantly to the efficient and effective functioning of the Zimbabwe economy and the maintenance of Zimbabweans’ standard of living, as well as to stimulating the expansion of existing businesses and the establishment of new ones. However, to operate efficiently businesses and factories need electricity supplies that are free of interruptions and shortages. In the past decade, domestic power generation capacity has fallen far below demand as a result of lack of maintenance of aging generation plants, and transmission and distribution facilities, as well as disruptions in the supply of coal for generation. Only 1,000 MW out of 2,000 MW of installed generation capacity is currently available, leading to unreliable power supplies and severe electricity shortages. The ongoing electricity supply interruptions in Zimbabwe continue to have serious repercussions for efforts to turn the economy around and achieve sustainable economic and social growth in the medium- and longer-term. An efficient and viable electricity sector will ensure economic stability and growth, given the forward and backward linkages with the rest of the economy.

On the institutional front, a new Electricity Act was promulgated in 2002. It provided for restructuring the power utility, ZESA, creation of the Rural Electrification Agency, and establishment of an autonomous regulatory commission that was expected to encourage investment in the power sector by putting in place an appropriate regulatory framework that was compatible with those of other SADC countries. Zimbabwe is also signatory to the SADC Protocol on Energy and an operating member of the Southern African Power Pool (SAPP).
2.2.4 Water Supply and Sanitation

Zimbabwe has limited water resources and generally depends on surface storage for its water needs. All of Zimbabwe’s major rivers are shared with other members of the Southern Africa Development Community (SADC). Zimbabwe cooperates actively with other members of SADC on the shared management of the region’s river systems, and it is a signatory to the Shared Water Course Systems Protocol, which provides the basis for management of the international rivers in the SADC countries. It is also an active member of the Limpopo and Zambezi basin communities which oversee joint management of these international rivers.

The largest user of water in Zimbabwe is the agricultural sector which accounts for about three-quarters of total consumption, followed by the domestic sector which accounts for about 15 percent and industry the remaining 7 percent. It is a major national resource and, up until the economic crisis of the previous decade, it was a crucial factor in Zimbabwe’s agricultural and industrial competitive advantage in the region. Access to improved water and sanitation has a direct positive impact on health in Zimbabwe, particularly among children. It also tends to raise school attendance rates, particularly for girls, and the ability of children to learn. Improvements in such areas in turn may have a high payoff in the long term in terms of productivity.

In the past decade, the water supply and sanitation systems in many urban and rural areas in Zimbabwe have deteriorated and water-dependent businesses have been adversely affected by shortages. Sewerage systems have experienced large-scale blockages, water treatment plants are dysfunctional and lack chemicals; and many distribution systems have fallen into disrepair. The failure of the electric power system to provide a regular and reliable supply of electricity has compounded the problem of operating the water supply and sewerage systems of urban areas and has contributed to collapse of the system. Erratic water supply has led to decreased industrial production and breakouts of water borne diseases exacerbated by overstretched systems.

On the policy and institutional front, there is no one document that provides a framework for the management of the country’s water resources and for the provision of water and sanitation services. A number of Acts of Parliament has addressed various aspects of policy, organization and administration of services in the sector. These include the following: the Water Act and the National Water Authority Act, both promulgated in 1998; the Land Acquisition Act of 2000; and the Environmental Management Act of 2002.

2.2.5 Information Communications and Technology

Equitable and adequate access to ICT is essential for growth of the Zimbabwe economy. Globally, ICT has become an important technological focus and its accessibility and affordability has increased exponentially in the past quarter century. With greater access to technology, workers are able to perform many everyday jobs much more swiftly and extra tasks away from the office. This, in turn, tends to increase productivity and enhance growth. For businesses, reliable and widely available ITC facilitates the rapid and free flow of information, which impacts positively on efficiency by helping to expedite communication and decision making by economic actors on the basis of readily available relevant information. ICT is also increasingly becoming an important instrument that is challenging the traditional methods of the commercial world. Greater accessibility to information through the use of computers also helps to enhance the quality of learning. It is also transforming the way students are being taught and the way governments are delivering services to people.

The SADC Protocol of 1996 called for member states to create a “harmonized regional telecommunications policy.” Subsequently, the Government did adopt a sector reform policy
that called for universal access to affordable telecommunications and postal services and emphasized the need for improvements in service availability and quality and the development of new services through de-monopolization and privatization. However, in the past decade Zimbabwe has lagged behind its regional counterparts in terms of ICT service penetration, and the rate at which new technology was adopted. This is mainly due to lack of resources for maintenance and significant new investment. As a result, there are a number of serious challenges in both the data and voice arenas, which are manifested by congestion and slow connections due to inadequate infrastructure. The usage of ICT services remains beyond the reach of most Zimbabweans and broadband penetration, in relation to international benchmarks, is also low and costs significantly more than recognized benchmarks.

2.2.6 Service Levels for Zimbabwe and Other SADC Members

In the early 1990s, the coverage and quality of the basic infrastructure of Zimbabwe was among the best in the region. In the past decade, the quality of these infrastructure assets has deteriorated. As things now stand, the amount and quality of the country’s infrastructure is roughly in line with that of other Southern African countries (Table 2.1), but as with many other Sub-Saharan countries, Zimbabwe now lags behind most other regional groupings in the world in infrastructure service coverage and quality. Zimbabwe does have one of the largest road and rail networks in the Southern Africa region. Although airport density is low and the related infrastructure dilapidated, railways, roads, and access to ports are somewhat better relative to conditions in other countries in the region. Access to power, water, and sanitation services is roughly comparable with other countries in the region. In the case of communications, mobile phone densities were among the lowest in the region in 2006, but access has improved sharply in the past few years. Use of the internet per 100 people, on the other hand, was the highest in the region in 2006, perhaps in reaction to inadequate access to mobile voice services.

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<tr>
<th>Table 2.1: Basic Infrastructure Coverage in Southern Africa, 2006</th>
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<td><strong>Transport</strong></td>
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<td>Zimbabwe</td>
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<tr>
<td>Road network (km)</td>
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<td>Rail lines (km)</td>
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<td>Percent of roads paved</td>
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<td>Road density for arable land</td>
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<td>Total road density</td>
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<td>Aviation passengers ('000)</td>
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<td><strong>Electric power</strong></td>
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<td>Generation capacity</td>
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<td>Electricity coverage</td>
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<td>Power consumption per capita</td>
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<tr>
<td><strong>Communications</strong></td>
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<td>Mainline density</td>
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<td><strong>Water and sanitation</strong></td>
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<td>Access to improved sanitation</td>
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2.3 MAJOR CHALLENGES IN REBUILDING BASIC INFRASTRUCTURE

2.3.1 The Key Challenges
The Report has undertaken a detailed examination of the development of basic infrastructure for the transport, power, water and sanitation, and information and communications technology sectors in the past decade, as well as the management of the services associated with this infrastructure. A number of basic findings have emerged from the assessment:

• The sustained deterioration in the quality of infrastructure assets stemmed from very inadequate levels of public expenditures for routine and periodic maintenance of the infrastructure networks, especially in power, water and sanitation, and transport.

• Infrastructure services in road transport and communications that are provided by the private sector are now more expensive than in neighboring countries, reflecting in part the economic costs of the deterioration.

• In other sectors such as power, rail transport, and fixed line communications, where services are provided by parastatals, prices have been kept low, and as a result, the economic costs of the deterioration have emerged in the form of large and, in some cases, unsustainable operating losses for these parastatals.

• The deterioration in the physical infrastructure has been accompanied by lack of progress in building institutional capacities for management and regulation of the basic services associated with these networks. Problems in this area stem from a disjoined approach to regulation and oversight among the ministries responsible for these sectors, compounded by a substantial loss of skills in the public workforce.

• The deterioration in Zimbabwe’s basic infrastructure in the past decade has, in turn, had a serious impact on other productive sectors of the economy and on the level and quality of services to the public at large.

• It has also resulted in minimal amounts of investment by the private sector in basic infrastructure, despite periodic efforts to attract such investment, for example, in the transport and communications sectors.

2.3.2 Decline in Infrastructure Quality and Capacity
Figure 2.1 illustrates aspects of the deterioration in infrastructure over the past decade and the resulting decline in levels of service. Highlights that emerge from these trends are as follows:

• The share of the total road network of almost 90,000 km in fair to good condition declined from 73 percent in 1995 to about 60 percent for much of the past decade. The additional 12,800 km of road network that was reclassified to poor condition requires complete rehabilitation, the cost of which is about $1.1 billion at 2009 prices.

• The economic collapse of the past decade also led to very large declines in rail and aviation services. In the case of the railways, for example, freight carried in the mid-1990s was about 14 million tons, equivalent to almost 80 percent of the network capacity. By 2009, the amount of freight carried was 2.7 million tons, equivalent to 15 percent of the original design capacity of the network. Demand for rail freight services was substantially larger than the 2.7 million tons that was actually carried. The problem was that the available locomotive and rolling stock capacity was not sufficient to meet this demand.

• Electricity consumption per capita in Zimbabwe was 738 kWh in 1995, when the average for low income countries around the world was 414 kWh per capita and the average for Sub-Saharan Africa was 437 kWh.
kWh. By 2008 per capita consumption in Zimbabwe had declined to about 600kWh per capita, only marginally higher than the average for all of Sub-Saharan Africa.

- By the latter part of the 1990s, the levels of service coverage for water and sanitation were among the highest in Sub-Saharan Africa. The country was widely seen, within Africa and internationally, as a leader in innovation, policy reform and service provision in the water sector. However, the fortunes of the sector were reversed in the past decade as a result of very limited new investment and maintenance for services and inadequate revenues of the institutions responsible for service provision. In 2000, 85 percent of the population had access to safe water and 68 percent had access to improved sanitation. By 2008, access to safe water had declined to 74 percent of the population, and access to improved sanitation stood at 41 percent. This deterioration culminated in a serious cholera epidemic in 2008 that affected more than 100,000 people and killed more than 4,000.

**Figure 2.1: Zimbabwe: Changes in Infrastructure Condition and Services**

- **Road transport**
  - Roads in fair to good condition (%)
  - Paved roads as % of total roads
  - Total vehicles per 1000 people
  - People injured or killed per 1000 vehicles

- **Rail transport**
  - Freight carried (tons)
  - Passengers
  - Freight as % of total capacity (right scale)

- **Civil aviation**
  - Aircraft arrivals
  - Passengers (right scale)

- **Electric power**
  - Installed capacity (MW)
  - Power consumption (kWh per capita)
  - Available capacity as % of installed (right scale)
  - Household electrification rate(%) (right scale)

- **Water supply and sanitation**
  - Households with access to safe water (%)
  - Households with adequate sanitation (%)

- **Information & communications technology**
  - Internet users per 100 people
  - Mobile accounts per 100 people

Source: World Development Indicators for various years, published by World Bank & Annexes 3 through 8.

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• Until very recently, Zimbabwe also lagged behind other African countries in the development of the communications, especially in voice traffic. In 1995, Zimbabwe had 0.1 mobile phone subscribers per 100 people, similar to the rest of Sub-Saharan Africa. By 2005, the number stood at 5.6 per 100 for Zimbabwe, 12.5 per hundred for Sub-Saharan Africa, and 30.6 for lower middle income countries around the world. As Figure 2.1 indicates, in the past few years, there has been a push to expand access to mobile telephony in Zimbabwe, with coverage standing at 28.4 per 100 by 2009.

### 2.3.3 Low Levels of Maintenance

Low levels of periodic and routine maintenance over the past 10-15 years have been the main cause of the deterioration in the quality of the basic infrastructure of the country. This decline is well illustrated by the experience of the transport sector. The current replacement cost of the transport infrastructure and facilities is estimated to be in the range of $12 billion. The current estimated cost of rehabilitating these transport sector assets is about $4 billion at 2009 constant prices. Once fully rehabilitated, a well-managed program of periodic maintenance of these transport assets would require capital outlays of about $550 million a year.\(^3\) The latter, equivalent to 15 percent of current annual GDP, is large relative to the size of the economy and to the amount of funding currently allocated to rehabilitation of the transport infrastructure network. As the subsequent analysis indicates, the high cost of rehabilitation relative to the GDP of the country and its related financing capacities poses a major challenge for policy makers.

Total capital spending by the National Government was about $45 million in 2009 (up from an estimated $7 million in 2008). The portion of this total devoted to rehabilitation of the transport infrastructure is not available for 2009, but the Ministry of Finance has reported a transfer of $6.4 million from ZINARA for road rehabilitation.\(^4\) A plausible estimate for total public spending on rehabilitation of transport infrastructure would therefore be in the range of $10 million—equivalent to about 2 percent of the above-mentioned required annual level of spending on periodic maintenance.

Lack of routine maintenance of the transport infrastructure over the past decade also contributed substantially to the deterioration in these assets and the current very large backlog of capital outlays required for rehabilitation. As Figure 2.2 indicates, in 2009 the spending on routine maintenance of transport infrastructure and facilities was estimated to be about $24 million, which was about 16 percent of the required level of annual maintenance.

Subject to the availability of adequate levels of funding, the proposed rehabilitation program for the decade ahead would restore these assets to full working condition. The challenge will be to ensure that there is adequate provision for maintenance of these rehabilitated assets. This will require a major reassessment of the manner in which maintenance requirements for the transport sector are funded.

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\(^3\) This estimate assumes an average life of 20 years for road and civil aviation assets, and 40 years for rail assets.

2.3.4 Costs of Infrastructure

Services are High

The direct and indirect costs of these infrastructure services are high. In the case of road freight services provided by the private sector, responses from private companies suggest that the average cost of road freight within Zimbabwe is in the range of 10 US cents per ton kilometer. These rates are substantially higher than those that apply on the regional road corridors in Southern Africa, which are typically in the range of 3 to 6 US cents per ton km. However, the indirect costs of transportation can be substantial; for example, there is scope for reducing transit freight rates between South Africa, Zimbabwe, and Lusaka in Zambia. The 2,300 km journey can take as much as nine days for freight traffic, half of which is spent at border crossings at Beitbridge and Chirundu. According to the World Economic Forum (2009), the country’s border administration is inefficient by regional comparison. Clearance by customs and other border agencies is excessively burdensome, costly, and time consuming; for example, it takes 67 days and costs $2,420 to import goods into Zimbabwe. In the case of mobile phone services provided by private operators, the World Bank (2009) reports that the price of a 3-minute local call during peak hours averaged $7.62 during 2000-06, and the cost of a connection charge for mobile services was $166.70 for the same period, both of which were the highest of any country in Africa by a very large margin.

In other cases where parastatals provide services, prices may be set at low rates but the indirect costs of service provision may be high. These costs arise in a variety of ways, including, for example, from supply problems, such as frequent electrical power outages, dependence on high cost power from private generators, and failure to supply water to firms and households on a regular basis. Systematic data on these types of costs are not readily available, but anecdotal evidence confirms the impact of these failures on costs for firms and households. As indicated in Chapter 1, an indirect measure of these types of costs is suggested by the rankings for Zimbabwe in the African Competitiveness Report of 2009. The quality of electricity supply, for example, has a very low ranking.

One of the major challenges facing the country in the decade ahead is the rehabilitation of the existing economic infrastructure and the addition of new capacity to meet existing and future demand in both urban and rural areas.
Map 2.1: Border Crossings and Customs Stations in Zimbabwe