

# **ENTERPRISE RESPONSE TO DEFICIENT INFRASTRUCTURE IN KENYA**

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# ENTERPRISE RESPONSE TO DEFICIENT INFRASTRUCTURE IN KENYA

An IPAR Discussion Paper

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IPAR DISCUSSION PAPER SERIES

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INFRASTRUCTURE IN KENYA**

Peter Kimuyu  
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## **ABSTRACT**

**O**wing to resource difficulties, flawed priorities and poor management, the growth of Kenya's stock of infrastructure has not kept up with shifts in demand, precipitating major shortfalls in service delivery. Although the theoretical implications of such shortfalls are unequivocal, data from Kenyan manufacturers reveal that enterprises are generally disenchanted with the state of infrastructure, the degree of disenchantment varying somewhat with sector, enterprise size and type of infrastructure. Roads, electricity and security are particularly worrisome. Although infrastructure problems alter the structure of production and distribution costs, the concerns relate more to deficiency than to costs, and perceptions about the severity of infrastructure problems vary by location, sector, enterprise size and service type. Where possible, enterprises have responded to these shortfalls by self providing for some of the services. Security and waste disposal self-provision are more prevalent, while food, metal and larger enterprises are more inclined to self provide. Considering that tax-based strategies aimed at increasing the revenue base have potentially undesirable impacts on economic activity, current efforts to build government-private sector/community partnership in the ownership, development, maintenance and management of infrastructure need to be strengthened, taking into account peculiarities exhibited by different infrastructure services. This will require erection of efficient cost-sharing mechanisms, appropriate legal backing for viable private sector infrastructure-related operations, and creation of exit options for service consumers.

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## 1. INTRODUCTION

Kenya had by the 1960s built a fairly modern infrastructure which helped to consolidate its position as East Africa's commercial centre. The capital city, Nairobi, and other major towns are the main regional road, rail and air links. Nairobi is also the hub of telecommunications within the region while the port of Mombasa is the gateway for many countries in the interior. Since infrastructure and related networks were considered strategic for national development their provision became the responsibility of the public sector. In subsequent decades, however, a combination of population pressure, poor maintenance due to inadequate outlays, resource difficulties and ineffective macroeconomic policies began to erode the quality of infrastructure provision. From the mid-1970s onwards, the country became increasingly unable to meet the infrastructure needs of the economy. There then followed a sharp regression in infrastructure service delivery and quality (Nalo 1993, Republic of Kenya 1995). But while the infrastructure's deterioration and its negative impact on the economy are not disputed, it is less clear how firms have been affected and which factors have determined their response to the deficient infrastructure. Likewise, the effects of poor infrastructure provision on firm investment and factor inputs require some investigation.

Since the early 1980s, Kenya has been implementing structural adjustment policies, a major goal being to increase investment and to encourage the development of the private sector. Improved infrastructure would lower production costs and increase market access. However, in today's more liberal economic environment, investors, both domestic and foreign, have a much broader choice of where to locate production and other activities. Other factors remaining equal, they would prefer to invest in regions or countries where the supply of infrastructure services is not problematic (Wheeler and Mody 1992).

In this paper, we look at infrastructure provision and its effect on manufacturing activity in Kenya using the Regional Programme for Enterprise Development (RPED) data. The primary sample for this data consisted of a total of 200 firms in manufacturing, 50 in food processing (ISIC 31), 32 in textiles and garments, 33 in wood working, and 38 in metal working. The sample included both formal and informal enterprises with 75% of the interviews in formal firms and 25% in informal ones. We restricted the sample to Nairobi, Mombasa, Nakuru, and Eldoret, which cover most formal manufacturing.

The formal firms were sampled from the Central Bureau of Statistics' master file. This file is continuously updated. However, there were numerous problems

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such as the inclusion of firms which either had never started or were defunct. Five size-strata were then defined for each of the four industrial sectors. These strata include microenterprises with 1 to 5 employees, small enterprises with 6 to 20, medium-sized enterprises with 21 to 75, large enterprises with 76 to 500, and very large enterprise with more than 500 employees. A total of 20 strata were defined for the formal sector.

From these, firms were randomly chosen according to their distribution among the four cities covered by the study. Other than this stratification by size, the selection was itself random across the four cities. Out of an initial primary sample of 150 formal firms, 12 declined to be interviewed. Some other firms were not found, had closed or switched into other activity. These firms that could not be interviewed were replaced by firms with the same characteristics from a reserve list.

A primary listing of firms engaged in the four sectors in the four cities was undertaken to construct a sampling frame for the informal sector. This listing was used to estimate the distribution of firms across the four sectors. A primary sample of 50 firms was then selected in the given proportions determined by these distributions. It was assumed, for purposes of the informal sample, that the best predictor of its distribution among the cities was the population. No stratification according to size was necessary for the informal sector subsample which therefore included only four strata, one for each industrial branch.

The second section provides an overview of the stock of infrastructure at the national level. This is followed, in the third section, by a review of recent studies on the relationship between infrastructure and enterprise development, including firm responses to deficient provision. Sections 4, 5 and 6 comprise the empirical sections of the chapter. In section 4, we discuss the responses of Kenyan firms to inadequate infrastructure provision, based on a number of tabular results. In section 5, these issues are explored further with a focus on the amenity effects of infrastructure provision. Section 6 looks at the factors that determine the incidence of the self-provision of infrastructure. The paper is concluded in section 7.

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## 2. THE STOCK OF KENYA'S INFRASTRUCTURE

Kenya's road sector is fairly well developed and is the most readily used mode for freight and passenger transport. A large proportion of the network is, however, "unclassified" and its maintenance is left to poorly funded local authorities or to poorly co-ordinated efforts by line ministries<sup>1</sup>. The "classified" component of the road network is under the Ministry of Public Works and Housing, and covers the main links from Mombasa through Nairobi to the borders with neighbouring countries. The latter are heavily trafficked, with high costs for repair and rehabilitation. Recent years have also seen marginal extensions, while flooding and other weather-related disasters have done considerable damage to roads (K-REP, 1998).

On the whole, paucity of resources has reduced the emphasis on modern infrastructure development, especially in urban areas, to maintenance of the existing network. With donor support, the development of an all weather road system in the rural areas, in order to incorporate rural dwellers into the modern economy, is being emphasised. This will involve selective upgrading of roads to bitumen standard, and intensive use of labour-based methods of road construction.

Closely related to the road network is the railway system. The railway played a crucial role in the opening up of the East African hinterland. However, railways have seen little development in the post-independence years. There have been serious lapses in maintenance, leading to derailments and collapse of bridges in the different parts of the country. The railway system is at moment quite inefficient and, though still potentially cheaper than other forms of transport, has been out-competed by the privately owned haulage companies.

Kenya's main port is at Mombasa, while Kisumu is an important port on the shores of Lake Victoria. Both provide services to other countries in the hinterland (Uganda, Rwanda, Burundi, eastern parts of the Democratic Republic of Congo, Southern Sudan, north-eastern Tanzania, Somalia and Ethiopia). The port throughput at Mombasa increased from 6.42 million tonnes in 1990 to about 7.54 million tonnes in 1996, but has fluctuated widely in recent years as the volume of relief food through Kenya to neighbouring countries increased (Republic of Kenya, 1994). Traffic is dominated by imports, which account for 70 per cent of the total cargo, with oil accounting for more than one-half.

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<sup>1</sup> Some of these include the Ministry of Transport and Communications, Ministry of Public Works and Housing, local governments and the Ministry of Environment and Natural Resources.

However, the quality of services at Mombasa has seen serious deterioration in the past decades. Port users complain about the inadequacy of existing capacity, both in terms of cargo handling and clearance from the port. Under pressure from industry and other users, the government undertook a thorough review of the problems facing the Kenya Ports Authority (KPA) and allied institutions. The review found that both the structure and operation of the KPA were inadequate. But although the government sent out tenders for the management of the container terminal and maintenance of port equipment, even going as far as enlisting foreign expertise, the problems of inefficiency indicated by high pilferage rates and long turnaround rates have persisted.

For many years, Nairobi has been the regional hub for international air traffic. In the past decade, expanding services have contributed to the development of tourism and the export of horticultural products, which are important sources of foreign exchange. The country's sole international airline, Kenya Airways, was privatised, with KLM acquiring the majority stake. Re-capitalised and under new management, Kenya Airways has gone on an aggressive drive to increase market share, opening a number of new routes, notably to West Africa. With the undergoing global deregulation of air transport, it is possible to surmise that a number of new configurations will emerge in the not distant future, probably involving the now closely co-operating East African countries.

Kenya's posts and telecommunications system was an offshoot of the commonly owned East African service organisations that preceded independence. Between 1990 and 1996, postal services in Kenya grew by some 5% (Republic of Kenya 1994) which is much lower than the total growth of the population. However, telecommunications are mainly urban based. But even there, direct access to telephones and other modern telecommunications has been poor.

With regard to water provision, rapid <sup>increase</sup> expansion of the urban population in Kenya, as well as deteriorating access to water in rural areas, especially the arid parts of the country, has put considerable pressure on existing sources. The national policy objective has been to ensure rapid development in the distribution of water in order to meet the rapidly increasing demand. However, there is a history of under funding and previous targets have not been realised. The bulk of the equipment is from the 1960s and there is a serious backlog of repairs and new investment. For example it was planned that by 1996, 62 per cent of Kenya's population would have access to water through organised water points without indicating how this was to be achieved in practice.

Kenya has sought to ensure an adequate supply of energy. A number of energy sources are used, although developed focuses only on a hand full: wood fuel, petroleum and hydroelectric power. Wood provides 70 percent of the country's total energy requirements. Ease of access has made it the most important energy source, not only in the countryside, but also in the cities. Policy towards the wood sub-sector seeks to ensure adequate wood supply, sustainable yields and environmental protection. Even then, many rural areas have suffered considerable degradation owing to excessive tree felling. Petroleum provides more than 80 percent of all commercial energy and is the main source of energy for the transport, industrial and agricultural sectors. All of the petroleum is imported.

Increasing power generation is another key long-term consideration for Kenya. Total installed capacity for electricity amounts to 842 megawatts (MW): 599 MW from hydro power, 168 thermal, 45 geothermal, while some 30 MW is imported from Uganda. The parastatal, Kenya Power and Lighting Company, has dominated power generation, both as a producer and distributor since the 1960s. While the company is able to use its immense size and outreach to pool resources for the development of energy sources, its monopolistic power as well as political clout enable it remain a price leader that often is predatory. Consumption of electricity has been growing at 5.7 per cent per year since independence, while the development of electric power capacity has lagged far behind. This had led to system overloading, resulting in power cuts and rationing. Other energy sources include wind, solar, ethanol, geothermal, coal and biogas.

### 3. INFRASTRUCTURE AND ENTERPRISE DEVELOPMENT

Africa's slow growth has partly been blamed on its inferior rate of infrastructure capital accumulation. However, while African governments tried to close the gap in the 1960s and 70s by expanding socio-economic infrastructure, there have been serious cases of non-performance in recent years owing to poor budgetary outlays towards expansion and rehabilitation (Lee and Anas 1992). This has resulted in power outages, inadequate and poorly managed telephone services, chronic water shortages and roads that due to poor maintenance obstruct communication more than they facilitate it. It has been argued that in early to medium stages of development the growth in the demand for basic infrastructure, including power generation, transport and communications, telecommunications, irrigation and agricultural extension services, often far exceeds the growth of the economy itself (Looney 1992, Neill 1996). Infrastructure bottlenecks are thus bound to arise, becoming a drag on economic growth. Hirschman (1958) argued that to overcome this, it is necessary to accumulate an excess of "social overhead capital". This would provide something of a general subsidy to producers, lowering costs of production across the board. For many countries in Africa, however, this has of course not been possible since infrastructure expansion has received low priority in the budgets of the crises-ridden economies (Lesueur and Plane 1994).

While the role played by infrastructure in economic development has attracted considerable attention, recent analyses have not produced clear-cut results on the size and nature of its effects (Ford and Poret 1991, Munnell 1992). A problem relates to the measurement of infrastructure services at the aggregate level. While liberally used in economic analysis, the term "infrastructure" is far from a homogeneous conceptualisation of goods, services or production level. For example, though roads and airports provide transport services, they operate under quite different environments. Similarly, while water-engineering techniques might be common to irrigation services as well as to electricity generation, the two are only vaguely related.

In applications, therefore, proxies for infrastructure, such as public sector capital expenditure (Aschauer 1989) or a measurable part of infrastructure such as road mileage, are used to represent total infrastructure (Talley 1996). The problems of interpretation and generalisation are thus considerable.

The above overview assumes that the impact of infrastructure is factor neutral. However, seen as an amenity to producers and consumers, infrastructure provision has implications for production decisions as well as labour markets.

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On the production side, the size and quality of infrastructure provision affects variable as well as fixed costs. An increase in variable costs, arising for example from the impact of poor infrastructure on transport costs, not only reduces the scale of production, but also directly affects the firm's price-setting decisions. On the other hand, the effect on fixed costs changes the profit-maximising level of output. In responding to the relative price shifts caused by malfunctioning infrastructure, the factor intensities of firms are bound to change. Firms might become capital or labour intensive depending on their possibilities for factor substitution. Furthermore, since infrastructure availability impacts on profitability, and thus the long-term viability of the firm, its quality influences the firm's localisation decision. Firms will thus locate in regions or countries where "certain conditional thresholds" with regard to infrastructure supply are met. This in turn influences the spatial distribution of domestic industrial activity, in effect determining the size of the industry as well as its employment capacity.

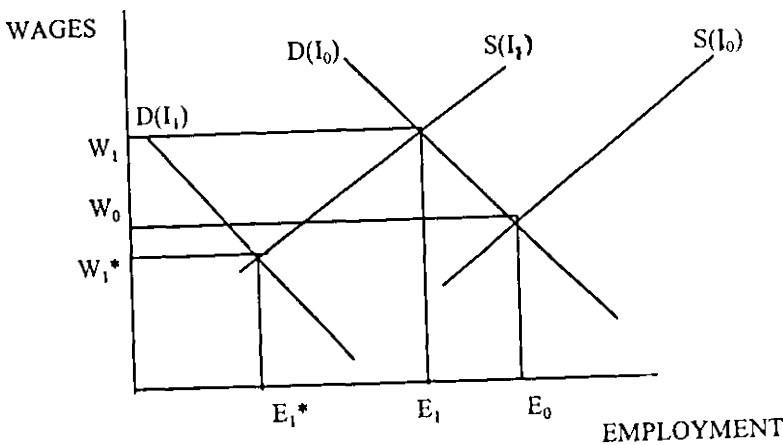
When infrastructure is a consumer amenity, its supply directly affects labour market behaviour and consumer welfare. Malfunctioning infrastructure, for example, raises both travel time and transport costs. Thus the private costs related to wage employment rise, along with the general cost of living. Labour supply then falls as the inter-regional migration or travel to the target region is reduced. The degree to which the reduction in labour supply affects firms in the target region depends on the extent to which infrastructure affects firm productivity i.e. the extent to which the supply of infrastructure reduces the firms' variable costs.

The consumer and producer amenity effects are illustrated in Figure 1 (see Dalenberg and Partridge 1997, p. 271). Labour market equilibrium is at  $A$ , with a market clearing wage rate,  $w_0$  associated to the employment rate,  $E_0$ . The demand,  $D(I_0)$ , and supply,  $S(I_0)$ , for labour are shown to be functions of the available infrastructure. Under the assumption that infrastructure is an amenity to households, i.e. reduces travel time and expenses, a decline in infrastructure supply pushes the labour supply schedule to  $S(I_1)$ .

Under the extreme assumption of infrastructure having no productivity effects on firms, its decline simply cuts labour supplies and raises wages. However, if the productivity effects of infrastructure on production are high, then a reduction in infrastructure supply reduces both employment (labour demand schedule shifts to  $D(I_1)$ ) and wages. In sum while the impact on employment is unambiguously negative via the amenity and productivity effects, that on wages is unclear. Focussing only on the impacts of infrastructure on employment would make it difficult to evaluate the extent to which infrastructure is an

amenity to firms (as opposed to households). The distinction is important because each alternative has distinct policy implications.

Dalenberg and Partridge (1997) have argued that when the consumer (or worker) amenity effects dominate, workers will be attracted to regions or sectors with improved infrastructure, leading to falling wages. Alternately, if productivity effects dominate, firms will demand more workers and wages will have to rise (see also Holtz-Eakin and Lovely 1996).



**Figure 1: Employment and wages when infrastructure is a producer and consumer amenity**

Generally, results from empirical estimations of the importance of infrastructure supply to economic performance have not been clear-cut. It has been suggested, therefore, that while there might be a common factor that binds growth and infrastructure together, it has been difficult to capture in the analysis. As has been argued in the case of aid and development (Burnside and Dollar 1997), it might well be that infrastructure expansion is most effective in good policy environments but could be outright ineffective in bad ones. In African oil economies, for example, the rapid expansion in infrastructure in the 1970s, in the face of booming incomes, was poorly planned and proved difficult to sustain. The increased supply of infrastructure was not beneficial to the economy.

It also has been argued that infrastructure performs badly in economics where there is little competition in service provision. Lack of "contestability" enables

public utilities, operating under soft budgets, to under perform (Baumol and Lee 1988). Lack of private sector alternatives makes firms captive, forcing them to adjust capacities or to attempt various forms of self-provision. When markets for infrastructure are opened up, firms cease to be captive and a more reliable supply improves production and lowers costs (Gramlich, 1994).

In the face of deteriorating infrastructure, enterprises will either relocate, undertake factor substitution, reduce output or resort to self provision (Economics Departments 1994). In the process, the response to infrastructure deficiencies revolves around the interplay between infrastructure supply, production technologies and the incidence of self-provision. In power provision, for example, firms might seek total self-sufficiency or some self-provision while retaining an active interest in public provision. They could also choose to maintain stand-by facilities or be satellites with respect to power services (Lee and Anas 1988).

These different regimes and their implications on firm production can be captured by specifying production functions that take into account the input of infrastructure services of varying quality and cost, depending on the nature of the firm's response. Modelling the production behaviour of an enterprise that is captive with respect to public infrastructure should thus incorporate the loss in output resulting from unanticipated input fluctuations, for example owing to power failure<sup>2</sup>. The behaviour of the self-sufficient firm can be captured in a nested optimisation set-up in which the firm seeks to maximise profits subject to costs. Self-provision alters the structure of costs and, therefore, the points of optimality. Between these polar cases lie other potential responses to power related problems, such as the purchase of stand-by facilities, or creation of satellite and joint production firms. However, whatever the response to deficient infrastructure might be, firms incur costs that are higher than if public sector provision was efficient.

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<sup>2</sup> For the captive firm, a possible formal presentation of its production configuration can be expressed as: maximize  $= P_q (1 - \mu) F(I, \mu, X, E) - P_x X - P_e E$  where the choice variables are  $X$  and  $E$  representing factors of production and electricity, and where  $P_q$ ,  $P_x$  and  $P_e$  are prices of output, inputs other than electricity, and electricity,  $\mu$  is the failure rate of publicly supplied power, and  $\mu$  represents the incidence of voltage fluctuations. In this formulation, it is assumed that power failure is randomly distributed and that production is continuous so that the enterprise ends up paying for the idle time since it is unable to anticipate the frequency and duration of random power outages. For the self-provider, there is no "uncontrolled" risk of failure such as that entailed by reliance on poor public infrastructure, although unit costs are correspondingly higher.

## 4. IMPACT OF THE DETERIORATION OF INFRASTRUCTURE ON ENTERPRISES

### 4.1 Correlation of Infrastructure Problems

Infrastructure problems are by no means isolated; they are dependent and actively reinforce each other. In Table 1 we present Pearson correlation coefficients between firm assessments of the extent of their problems with infrastructure provision. The coefficients are generally high and significant, but with some interesting differences. The correlation coefficient between roads and waste disposal is relatively high (0.43). This indicates the obvious fact that poor roads in the industrial areas have made access very difficult, especially for rubbish collection. For similar reasons, the correlation between telephones and roads is high since access for repairs and service becomes difficult when roads are impassable. We also note that security and roads are significantly correlated, again pointing at access. It is noteworthy, however, that waste disposal is correlated with all other infrastructure types implying that it affects all firms. Water is only significantly correlated with waste disposal and electricity while electricity is correlated with all infrastructure types except security. Table 1 thus illustrates cross-cutting effects which are likely to affect the performance of manufacturing enterprises.

**Table 1**  
**CORRELATIONS OF INFRASTRUCTURE PROBLEMS BY TYPE**

	Electricity	Water	Roads	Telephones	Waste	Security
Electricity	1 (0.0)					
Water	0.2111 (0.0016)	1 (0.0)				
Roads	0.1632 (0.0147)	0.1069 (0.112)	1 (0.0)			
Telephones	0.2458 (0.0002)	0.1088 (0.1059)	0.3363 (0.0001)	1 (0.0)		
Waste	0.1329 (0.0474)	0.1402 (0.0368)	0.4258 (0.0001)	0.1791 (0.0073)	1 (0.0)	
Security	0.0288 (0.6795)	0.0751 (0.2834)	0.906 (0.0059)	0.1919 (0.0056)	0.2221 (0.0013)	1 (0.0)

Source: Computations for this paper.



## 4.2. What Enterprises Consider as the Greatest Infrastructure Problem

During the RPED interviews, firms were asked to indicate their greatest problem with respect to infrastructure provision. Given that infrastructure comprises disparate components, however, it is difficult to devise a measure for the total effect. Still, with regard to specific infrastructure types such as electricity and roads the sample firms had a clear perception of the extent to which their activities were affected by the poor provision. Table 2 shows that in the early 1990s, roads and electricity had become the 'greatest' infrastructure problem for over 25 per cent of the firms in the sample.

Security was considered the 'greatest' problem by close to 16 per cent of respondents while other infrastructure types had a much lower degree of severity, with less than ten per cent considering telephones, water, and waste disposal to be among the greatest infrastructure problems they were facing.

**Table 2**  
**GREATEST PROBLEM WITH INFRASTRUCTURE BY TYPE**  
**AND SUB-SECTOR (%), 1992**

Sector	Electricity	Water	Roads	Teleph.	Waste Disposal	Security	Other
Food	21.7	15.2	3.7	6.5	10.9	8.7	-
Textile	36	8	20	8	12	12	2
Wood	18.2	7.3	43.6	9.1	-	16.4	1.8
Metal	22.6	3.8	15.1	13.2	9.4	24.5	5.7
Average	24.5	8.3	28.9	9.3	7.8	15.7	2.5

*Source:* Departments of Economics (1993)

As expected, there is considerable variation in responses depending on the sector and size of the firm. Thus while electricity provision is crucial for all firms, large-scale operations could be assumed to be more vulnerable to poor electricity supply. Table 2 shows that textile firms are, for example, much more affected by poor electricity provision than firms in other sectors. Similarly, water supply is more constraining in the food sector, where it is a crucial input throughout the production chain, than in others. On the other hand, only about 4 per cent of firms in the metal sector considered poor water provision as their greatest infrastructure problem.

A similar pattern emerges with respect to roads. The wood sector is transport intensive, with the raw material either imported from neighbouring countries or collected from remote regions of the country. Furthermore, sawmills are located near forests, to ensure a steady and less costly supply of timber and thus away from the main roads. Over 40 per cent of the firms in the wood sector saw roads as their greatest infrastructure problem, while, for similar reasons, the food sector had 37 per cent of the respondents indicating roads as a serious problem. The textile and metal sector also depend on bulk transport for their supplies and distribution of output. Roads were said to be a serious problem for up to 20 per cent of firms in these sectors.

In the early 1990s political conflicts related to demands for multiparty democracy and the elections increased the level of insecurity in Kenya. In the run up to the national elections of 1992, for example, there were violent eruptions in various parts of the country. It would appear that the metal sector had the most serious problems with security, with close to a quarter of the firms seeing it as their greatest infrastructure problem. This is perhaps related to the fact that the metal sector in Kenya is dominated by firms owned by Kenyans of Asian origin and by expatriate firms. Both groups have suffered economically, if not physically, in periods of political crisis.

Firms in wood also perceive security as a serious problem. While many firms in the sector were small and "indigenous", there were large sawmills in politically destabilised regions such as Burnt Forest in the Rift Valley. These firms were forced to scale down or suspend operations.

**Table 3**  
**GREATEST PROBLEM WITH INFRASTRUCTURE IN**  
**MANUFACTURING BY TYPE & FIRM SIZE**

Size	Electric.	Water	Freight Trans.	Roads	Teleph.	Waste Disposal	Security	Other
Micro	32.7	10.9	—	10.9	10.9	9.1	21.8	3.6
Small	27.0	5.4	2.7	37.8	5.4	10.8	5.4	—
Medium	18.8	12.5	—	26.6	10.9	6.2	21.9	1.6
Large	20.5	2.6	2.6	51.3	7.7	5.1	7.7	2.6
Very large	22.2	—	11.1	22.2	11.1	11.1	11.1	11.1
Average	24.5	8.3	1.5	28.9	9.3	7.8	15.7	2.5

Source: Departments of Economics (1993)

Note: Firm size is by number of employees as indicated earlier.

In Table 3, we look at the problems with infrastructure from the point of the size of the firm. Two observations can be made about the pattern arising in the table. First, the impact on the smallest companies, often referred to as the 'informal sector', seems to differ markedly from the rest. From the point of view of small firms, infrastructure can be divided into a part with 'free' access, notably roads and one with 'restricted' access, such as electricity, water and telephones. Access is restricted because firms need to satisfy certain requirements in order to have access to the relevant infrastructure. The requirements in Kenya include formal registration with the registrar of companies and possession of a physical business address. However, while access to infrastructure is a clear benefit of formality (visibility), there are also costs: when firms become formal, their liability to taxation increases.

With regard to roads, where access is free, informal firms are least affected. Their markets are often in close proximity to their business premises, while the size of the business does not demand large stocks or transport of bulky goods. On the other hand, the bigger companies are more vulnerable to poor road infrastructure. For example, over 30 per cent of medium to large firms saw roads as their greatest infrastructure problem.

With respect to the 'restricted' infrastructure, small firms considered electricity provision to be their greatest infrastructure problem. In their case, the problem extends beyond inadequate performance or outages to lack of connection to the mains for reasons pointed out above. Table 3 shows that these problems were repeated for water and telephones with the smaller firms experiencing more difficulties than average.

With respect to security, small firms are again more affected than average. They often operate in a grey zone where informality reduces their legitimacy and exposes them to higher levels of insecurity. Small firms also operate close to their clients, often as extensions of household activities, in the more densely populated sections of the urban centres. They are thus often embroiled in the political and civil disturbances. Not infrequently, their business activities are badly affected during police "cleaning-up" operations.

As noted in the overview above, access to infrastructure supply can be problematic for three major reasons. First, while the requisite infrastructure might be in place, poor maintenance and inadequate capacities lead to frequent breakdowns and thus to deficient operation and inadequate supply of services. However, poor access might also simply be due to lack of infrastructure, as when the government fails to extend water supply to certain areas. Furthermore, the cost of infrastructure services might be prohibitive.

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With the help of Table 4, we discuss briefly the firms' assessment of the quality of infrastructure provision in relation to the three constraints: deficient operation and supply of services, absence of infrastructure, and prohibitive costs.

**Table 4**  
**WHY INFRASTRUCTURE OF A CERTAIN TYPE IS A PROBLEM (%)**

	Electricity	Roads	Water	Teleph.	Waste Disposal
Deficient	73.1	67	54.5	90	40.2
Not Available	11.5	21.6	13.8	14	50.5
Too Expensive	7	-	-	15	2
Other	8.5	11.4	16.3	6	7.3

Still, owing to slow infrastructure expansion in the face of rapid population growth, poor access is often simply a result of lack of provision. Over 10 per cent of the respondents found electricity supply to be a problem because it was not provided at all, 14 per cent found it difficult to acquire telephone lines because they were not available, while over nearly 14 per cent could not be connected to water. With regard to waste disposal, over 50 per cent of the respondents simply had nowhere to deposit their waste. It is significant that firms do not consider the cost of infrastructure services per se as a major constraint. Only 7 and 15 per cent indicated that electricity and telephone tariffs, respectively, were too high. There were, however, other complaints such as the lack of permits to set up own infrastructure.

With regard to security, a slightly different form of infrastructure from the rest, respondents saw the escalating cases of armed robberies, as a serious problem. As noted earlier, the increase in insecurity was not unrelated to the political tension that arose during and after the election campaigns of 1992. Thus the escalation was perhaps of a one-shot character. Still, burglaries were reported by many firms, which blamed them for the rising cost of security provision.

In 1994, firms were asked if they had noted improvements in infrastructure provision by type since the interviews a year earlier. Table 5 shows that only a small percentage of the firms had seen an improvement in infrastructure supply, while the majority had seen no improvement or had seen a deterioration. On the average, close to 63 per cent of the firms interviewed had noted deterioration in roads. The food and wood sectors, whose activities are transport intensive, reported the largest deterioration. With regard to electricity, the food sector noted a sharp deterioration with close to 75 per cent of the firms noting poorer

performance. However, there is a clear difference between the response of the formal sector (generally larger) and the informal sector (small and unregistered). Relatively fewer smaller firms report infrastructure deterioration than the bigger or formal sector ones. Thus while 80 per cent of formal firms reported deterioration in roads only 36 per cent of the informal firms did so. A similar pattern is observed for electricity and telephones.

**Table 5**  
**DETERIORATION IN INFRASTRUCTURE AND CHANGE IN PROFITS**  
**BY TYPE AND SECTOR (%), 1993 VS 1992**

Sector	Electric.	Water	Roads	Teleph.	Higher Profits	Lower Profits
Food	74.7	18.2	86	78	78.5	13.7
Textile	27.1	21.4	39.6	37.1	52.6	48.9
Wood	43.4	52.8	66.3	23.6	35.6	36.1
Metal	46.2	15.9	49.2	23.7	37.1	50.5
<i>Average</i>	<i>50.7</i>	<i>24.1</i>	<i>62.6</i>	<i>46.1</i>	<i>55.8</i>	<i>33.2</i>
<i>Formal</i>	<i>61.8</i>	<i>27.3</i>	<i>80.5</i>	<i>63.8</i>	<i>78.7</i>	<i>15.4</i>
<i>Informal</i>	<i>33.3</i>	<i>18.4</i>	<i>35.9</i>	<i>13.9</i>	<i>22</i>	<i>59.4</i>

Source: Departments of Economics (1993).

In Table 5, two columns summarising responses to the question whether firms had noted higher (or lower) profits in comparison to the previous year are inserted.<sup>3</sup> It is interesting to note that while firms in the food sector experienced severe infrastructure deterioration (75 per cent record deterioration in electricity provision, 86 per cent deterioration in road transport, and 78 per cent deterioration in supply of telephone services), they at the same time record higher profits. Close to 80 per cent of the firms in the food sector (accounting for 32 per cent of total employment in the sample) recorded higher profits compared to the previous year. The figure for textiles is about 53 per cent, while those for wood and metal are 36 and 37 per cent, respectively.

Formal firms were more profitable between the two waves than informal ones. However, the conclusion is clearly that poor and deteriorating infrastructure co-existed with higher firm profits.<sup>4</sup> The discrepancy might partly

<sup>3</sup> The first wave (1993) posed questions on 1992 and the second wave (1994) on 1993.

<sup>4</sup> Figures drawn from the third wave (1995) show that firms, which thought that profits had risen, were fewer than in the previous year, but still substantial. While infrastructure provision, according to the firms, deteriorated further.

be the result of the form and sequencing of the questions. For example had the question 'Has the deterioration of the infrastructure negatively affected your profits?' been paused many answers would undoubtedly have been in the affirmative. In other words, firms would have generated even higher profits in the absence of the infrastructure constraints.

Still, the result illustrates interesting features of firm adaptation: it is possible that in the short-run firms can devise shock absorbers that can see them through the difficult infrastructure downturns. This would include self-provision of infrastructure as noted elsewhere in this chapter. However, without the adequate infrastructure, markets are bound to remain thin and profits cannot be sustained.

It might also be worth speculating whether poor infrastructure is not a form of entry barrier in some sectors. It definitely raises start up costs, enabling veteran firms that adapted to bad conditions over the years by, for example, acquiring own generators and water tanks, to enjoy monopolistic profits when markets expand.

## 5. AMENITY EFFECTS OF INFRASTRUCTURE PROVISION

In this section we investigate the extent to which sector and region-specific differences impact on the provision of infrastructure. This investigation is done by regressing firm "infrastructure scores" (with no problem on a particular infrastructure scoring 1 and serious problem scoring 5) on dummy variables for the region where the firm is situated, its sector of description, as well as on the size of the firm itself.

Following the theoretical aspects outlined above, we expect that regions that are at a remove from markets (the bigger urban areas) would be more apt to be dissatisfied with their road services while those in the proximity of the cities would complain more about congestion or poor waste disposal. Likewise, it would be expected that the metal sector might be more affected by poor electricity supply than the food sector while the latter might be more affected by poor water supply. It would also be interesting to see what impact size has on the infrastructure scores for the various types. Since our size variable is based on total employment, the sign of the coefficient for size could give us some clue for the relationship between the firms' perception of the adequacy of infrastructure services and its level of employment.

Table 6 presents results from OLS regressions where the dependent variable is the "firm score" for the various infrastructure types discussed above. The explanatory variables are dummies for Nairobi, Mombasa and Nakuru (with Eldoret as the reference), dummies for textile, wood and food sectors (with the metal sector as the reference) and the size of the firm proxied by total firm employment. A quick evaluation shows that the regressions for roads and air and sea transport had the "best fit" although generally the results collaborate rather well with the discussion above. Still, there are a number of divergent results that need some elaboration.

In the table, a negative coefficient indicates that compared to the reference region or sector, the relevant region or sector has fewer firms that have experienced problems with infrastructure of the given type. A negative sign for size indicates that the bigger the firm, the less problems it has with infrastructure.

In the regression for electricity, the dummy for Nairobi was significant, with a large coefficient. Relative to Eldoret, electricity provision is perceived by firms in Nairobi to be poorer than in other towns in the sample. With respect to water, Nakuru firms have more serious, and statistically significant, problems with water than Eldoret and other regions of the sample. The table shows that compared to the metal sector, the food sector has serious problems with water

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supply, with a relatively large and significant coefficient.

**Table 6**  
**ESTIMATION RESULTS FOR FIRM ASSESSMENT OF**  
**INFRASTRUCTURE PROBLEMS**

	Electricity	Water	Freight Transport	Roads	Telephones	Air & Seaports	Waste Disposal	Security
Intercept	2.08* (0.441)	1.66* (0.395)	1.42* (0.302)	1.56* (0.442)	2.68* (0.418)	1.4* (0.235)	1.8* (0.43)	3.1* (0.43)
Nairobi	0.68* (0.412)	-0.073 (0.369)	0.175 (0.282)	1.46* (0.413)	0.0525 (0.3911)	0.291 (0.22)	0.727* (0.402)	-0.2 (0.404)
Mombasa	0.445 (0.469)	0.461 (0.421)	-0.18 (0.322)	-0.218 (0.471)	-0.681 (0.446)	0.019 (0.251)	-0.252 (0.458)	-0.629 (0.460)
Nakuru	-0.074 (0.512)	0.897* (0.476)	0.235 (0.365)	0.902* (0.533)	-0.279 (0.504)	0.312 (0.284)	-0.103 (0.519)	0.065 (0.522)
Textile	0.231 (0.318)	0.141 (0.285)	-0.373* (0.218)	-0.087 (0.319)	-0.367 (0.302)	-0.488* (0.170)	-0.141 (0.311)	-0.683* (0.312)
Wood	-0.224 (0.332)	0.017 (0.297)	0.055 (0.227)	0.928* (0.333)	0.146 (0.315)	-0.423* (0.177)	0.160 (0.324)	0.009 (0.325)
Food	0.28 (0.337)	0.64* (0.302)	0.271 (0.232)	0.251 (0.339)	-0.237 (0.321)	-0.423* (0.180)	0.333 (0.329)	-0.614* (0.331)
Size	-0.026 (0.031)	0.025 (0.028)	0.038* (0.021)	0.012 (0.031)	-0.0178 (0.030)	0.074* (0.017)	-0.0437 (0.031)	0.029 (0.031)
R <sup>2</sup>	0.05	0.08	0.076	0.20	0.051	0.144	0.08	0.067
Prob>F	0.1913	0.021	0.028	0.0001	0.1607	0.0001	0.018	0.057

Note that except for the size variable, which was proxied by total firm employment (divided by 100 to scale it down), the rest of the explanatory are dummies (standard errors are in brackets). Since we are using dummies, the reference for the regions is Eldoret and that for the sectors is metal. An asterisk indicate significance at the 10 percent levels or better.

The results for freight transport and air and seaports are quite similar. With respect to freight transport, the textile sector seems to have less problems than other sectors. The same seems to be the case with respect to air and seaports<sup>5</sup>. Relative to the metal sector, textiles, wood and food seem to have fewer problems with air and seaports.

<sup>5</sup> It is, however, possible that the definition of the textile sector used here groups together tailors and other individuals working in the informal sector with the bigger textile companies. The smaller firms have a ready market and might not have freight transport problems. <sup>6</sup> As noted above, the questions related to security had more immediate implications in the region where Nakuru and Eldoret are situated during the aftermath of the 1992 elections, than elsewhere in the country.



This is most probably because they are less dependent on imported inputs, and exports of finished products, than the metal sector. The wood and food manufacturing sectors get their supplies from domestic sources, while they export little or not at all. The textile sector also receives the bulk of its inputs from domestic sources.

With regard to roads, firms in Nairobi and Nakuru are relatively more affected than those in Eldoret or Mombasa. In Nairobi, firms also complain about the high level of congestion in the industrial areas of the city, especially since their carrying capacities remain generally at the independence levels while traffic has increased by many times. It is also significant that the dummy for the wood sector has a large and very significant coefficient, indicating the difficulties that lumbering and wood processing firms have in transporting bulky wood products over poor roads.

The outcomes for telephones were insignificant. But a number of the coefficients had negative signs (for example for Mombasa and Nakuru) showing that telephones were less of an impediment to activities than other infrastructure types. With respect to waste disposal, Nairobi seems to be the city where the problem is significant, the negative signs for Mombasa and Nakuru indicate a less serious problem there.

Regarding security, the problem seems to have been less pressing in Nairobi and Mombasa than in Eldoret and Nakuru. At the sector level, textiles and food have fewer problems with security than the other sectors<sup>6</sup>.

Finally, let us revisit the size variable. As indicated earlier the size of the firm was simply inferred from the number of its employees. The size variable is only significant in two cases, freight transport and air and seaports. Since the coefficients are positive, this also indicates that the bigger firms are more dissatisfied with their level of service provision in these two categories than smaller firms. Better provision would lower firm costs and help preserve or increase employment. The two infrastructure types would in this regard be producer amenities.

Still, as we showed above, firm evaluations of the quality of infrastructure services are quite correlated and firms demand or need a good and adequate combination of services in order to function properly. It is clear that while a good supply of a particular infrastructure type could lower costs.

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<sup>6</sup>As noted above, the questions related to security had more immediate implications in the region where Nakuru and Eldoret are situated during the aftermath of the 1992 elections, than elsewhere in the country.

## 6. THE INCIDENCE OF SELF-PROVISION

In order to remain in business, manufacturing enterprises in Kenya have been forced to address a wide range of infrastructure problems on their own. Ability to do this has varied with the size of the firm as well as the sector in which it operates. The cost of self-provisioning as well as the potential returns of installing own aggregates are also important considerations. In Table 7 we present the incidence of self-provisioning by sector. While we showed above that poor roads and deficient electricity supplies are among the greatest infrastructure constraints facing Kenyan firms, they are not easy to remedy at the private level. Thus few firms embarked on the construction of private access roads and only about 9 per cent were able to install a power generator.

Firms in the wood sector often operate in remote areas and seem to have a higher propensity to purchase generators. Table 8 shows that larger firms were more inclined to purchase generators than smaller ones. Up to a quarter of the larger companies (about 50) had installed private power generators.

**Table 7**  
**SELF-PROVISION OF INFRASTRUCTURE SERVICES BY SECTOR (%)**

	Food	Textile	Wood	Metal	Average
Generator	8.5	4.0	8.0	7.8	7.0
Security	55.5	51.4	52.0	50.3	52.3
Waste Disposal	25.6	21.7	23.3	25.7	24.1
Wells/Cisterns	15.2	5.1	12.0	11.4	10.8
Transport for					
- workers	5.5	4.0	8.0	7.8	6.3
- freight	7.3	12.0	13.3	7.8	10.1

**Table 8**  
**SELF-PROVISIONS OF INFRASTRUCTURE SERVICES BY FIRM SIZE (%)**

	Micro	Small	Medium	Large	Very large	Average
Generator	0	1.3	10.0	16.3	22.7	7.0
Security	28.0	42.4	68.3	72.1	63.6	52.3
Waste Disposal	11.0	17.2	36.1	29.5	45.5	24.1
Wells/Cisterns	1.7	4.0	15.0	20.2	40.9	10.8
Transport for:						
- workers	1.2	5.3	6.1	10.1	31.8	6.3
- freight	1.7	6.6	13.3	16.3	36.4	10.1

*Note:* Firm size is by employment bracket and defined as follows: 1-5 for micro, 6-20 for small, 21-75 for medium, 76-500 for large, and 501 or more for very large enterprises.

**Table 9**  
**SELF PROVISION OF INFRASTRUCTURE SERVICES BY TOWN (%)**

	Nairobi	Mombasa	Nakuru	Eldoret
Generator	6.9	7.0	7.8	7.3
Security	56.2	35.7	50.0	60.0
Waste Disposal	29.1	9.6	15.6	25.5
Transport for:				
- workers	7.8	3.5	3.1	3.6
- freight	10.2	4.3	12.5	18.2

The acquisition of a regular source of power is closely related with the pursuit of other corporate objectives. Thus more than one-half of the enterprises that acquired stand-by generators also bought some other new equipment (Kimuyu 1998 a&b). However, save for cases in the urban areas, for example in Nairobi's River Road where several informal producers had purchased a reconditioned generator for joint use, few informal or small firms purchased new standby equipment, the high cost of the power aggregates being a major deterrent. Thus, on the whole, informal enterprises were more likely to be captive to public utilities than their formal sector counterparts.

Besides a well-developed infrastructure, peace and security are key factors for choosing Kenya as a business location. However, the past decade has seen a marked deterioration in the security situation. In a bid to protect their investment, firms responded by taking increasing recourse to private security arrangements. Table 7 shows that over 70 per cent of the firms had hired security guards or made other security arrangements. The wood sector seems to have had a higher need for security than other sectors. Further, firms with own security arrangements are preponderantly from the larger, formal, sector (Kimuyu 1998b). Thus while less than 50 per cent of the smaller firms make security arrangements, close to 90 per cent of the bigger firms have security provisions of their own. As in the case of power generation above, enterprises with own security provisions also seem to have increased investment in equipment (Kimuyu 1998a). This again reflects that business decisions are closely interwoven with availability of infrastructure. In this case infrastructure availability is driving investment. A spin-off from the increasing need for security has been the rapid growth of a market for the provision of security in Kenya.

The expanding manufacturing activity has also meant increased amounts of industrial and other waste. However, it is now clear that the industrial areas put aside during the colonial era have become overcrowded, accommodating more

companies than can be provided with adequate infrastructure. Table 7 shows that over 40 per cent of the firms had made their own arrangements for waste disposal. However, this in no way implies that the rest were adequately catered for. Indeed the dumping of waste is more the rule than the exception in parts of Nairobi's Industrial Area. Table 8 again shows that the larger companies were more predisposed to private arrangements for waste disposal than smaller ones.

Some enterprises have put in place their own water systems, usually in the form of boreholes and water cisterns, to counter the unreliable public services. Tables 7 and 8 show that close to 20 per cent of the sample had standby arrangements for water supply, with larger companies doing it more frequently than smaller ones. It is again indicative that more than one-half of the enterprises that acquired new equipment also had a standby source of water supply.

Finally, firms are constrained by the availability of transport, for the transport of workers, that is public transport, and for inputs and finished products. Tables 7 and 8 show that 16 per cent of the firms provided transport for their workers. Again the larger companies are best placed to do this, with 70 per cent of the largest category providing transport, while only 3 per cent of the smallest firms were able to do so.

Much the same trends are evident in the case of freight transport. Over a quarter of the firms provide their own freight transport, with larger companies doing it more frequently than smaller ones. Over 50 per cent of the larger companies have access to their own freight transport but only about 5 per cent of the smallest ones.

Table 10 presents results from a probit analysis of the determinants of self-provision of infrastructure services. The explanatory variables are size and export activities. These are accompanied by location, sector and wave dummies.

The results suggest firm size has a positive impact on the probability for self-provisioning. Except for freight and workers' transport, the estimates are however insignificant.

Furthermore, enterprises with an active interest in the export markets are more likely to provide own infrastructure services. The exception to this is transport for workers which exporters appear less inclined to self provide.

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**Table 10**  
**PROBIT RESULTS FOR THE DETERMINANTS OF THE**  
**SELF-PROVISION OF INFRASTRUCTURE**

	Generator	Water	Waste Disposal	Security	Freight Transport	Workers' Transport
Intercept	-1.551* (0.343)	-0.987* (0.295)	-0.298 (0.231)	0.392 (0.213)	-0.649* (0.285)	-1.772* (0.553)
Size	0.030 (0.020)	0.029 (0.020)	0.029 (0.021)	0.041 (0.027)	0.053 (0.023)	0.120 (0.034)
Exporter	0.791* (0.184)	0.835* (0.174)	0.472* (0.143)	0.474* (0.137)	0.375* (0.193)	-0.123 (0.240)
<i>Towns:</i>						
Nairobi	-0.203 (0.311)	-0.364 (0.271)	0.038 (0.209)	-0.172 (0.192)	-0.404 (0.254)	0.966* (0.538)
Mombasa	-0.029 (0.347)	-0.012 (0.296)	-0.694* (0.261)	-0.638* (0.218)	-0.732* (0.323)	0.556 (0.589)
Nakuru	-0.035 (0.382)	0.069 (0.342)	-0.354 (0.278)	-0.278 (0.240)	-0.178 (0.321)	0.655 (0.626)
<i>Sectors:</i>						
Food	0.167 (0.217)	0.303 (0.195)	0.088 (0.160)	-0.223 (0.144)	0.023 (0.228)	-0.397 (0.270)
Textile	-0.192 (0.224)	-0.302 (0.229)	-0.093 (0.163)	0.091 (0.142)	0.262 (0.216)	-0.532* (0.287)
Wood	0.095 (0.224)	0.122 (0.207)	-0.018 (0.166)	0.105 (0.147)	0.313 (0.219)	-0.019 (0.248)
<i>Waves:</i>						
Wave2	-0.449* (0.213)	-0.849* (0.191)	-0.618* (0.135)	-0.403* (0.124)	-1.047* (0.188)	-0.897* (0.217)
Wave 3	-0.792* (0.184)	-0.617* (0.171)	0.975* (0.146)	-0.591* (0.125)	-1.367* (0.223)	-7.276 (13544.49)
Log Likelihood	-146.139	-186.816	-312.430	-418.673	-167.376	-107.087

*Notes:* Figures in brackets are standard errors. Eldoret, metal working and wave I were excluded from the location, sector and wave dummies. Figures marked with an asterisk are significant at 10% level or better.

Regarding location, the results are generally weak, though for the most part negative, indicating that enterprises operating in the bigger towns (Eldoret is the point of reference) were less likely to self-provision. Results are only significant for Mombasa and firms situated there are less likely to self-provision in waste disposal, security, and freight transport. These results are consistent with Mombasa's less crowded industrial areas and better access to infrastructure services. Notably, being a port, freight transport is not as cumbersome as in up-country Nairobi. Though neither strong nor consistent, the sector results indicate that the probability for self-provisioning in textiles and metal is lower than in food and wood. This is directly linked to the fact that in textile and metals

firms are smaller so that self provision is likely to suffer from small-diseconomies. Finally, the results suggest that there were significantly more self provisions reported in the first wave relative to subsequent waves, which mimics the fact that the provisions reported in the second and third waves were incremental.

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## 7. CONCLUSION

In this paper, we have looked at the impact of Kenya's increasingly deficient infrastructure on the manufacturing sector. Though the country's infrastructure problems have been accumulating for most of the past two decades, as budgets for repair and expansion have declined, their seriousness has only become a major policy concern in the era of structural adjustment. The market access and opening up of the economy sought by the economic reforms might be difficult to achieve in the absence of an efficient infrastructure.

The inability of the public sector to provide an adequate level of services has forced individual firms to devise own coping mechanisms. Thus many have sought to change production techniques or to purchase their own infrastructure aggregates. However, although self-provisioning ensures a regular supply of services, it often implies higher production costs, with negative implications for general welfare. Moreover, in some cases, such as roads, railways, harbours and telephones, self-provisioning has in the past not been possible. Thus on balance firms were never entirely able to safeguard themselves from the effects of a malfunctioning infrastructure.

How then should the provision of services be enhanced? To bring about a real improvement, the flow of resources to infrastructure and related services has to improve. In recent years, the government has tried to do this by increasing levies on automotive fuels and introducing road toll. However, tax based solutions do not always have a favourable impact on economic activity and it is necessary to devise other forms of delivery, such as those based on a partnership between the government and the private sector or the private sector and affected communities or sectors.

In pursuit of a broader approach to infrastructure provision in Kenya, a number of important issues arise. First, there is need to create an environment that is supportive of private sector participation. The appropriate legal structures that enable viable private operations, such as stipulations on power and water tariffs, need to be put in place. However, a number of groups benefitted from the earlier controls and payment systems in the utility sector and the government needs to overcome their resistance while focusing on an expeditious implementation of the new regulations.

Second, to enhance efficiency in delivery of services, individual consumers and companies must be availed an exit option. It must be possible to punish poor service by moving to another supplier. In the telecommunications sector, for example, services have been provided through non-transferable contracts

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between the parastatal and the consumers. With captive consumers, the parastatal responded slowly or not at all to complaints regarding poor service. There are thus demands for a secondary telecommunications carrier to encourage competition, leading to price discipline and reduced costs for consumers. The power industry in Kenya also needs more producers and independent distributors. As in the case of telecommunications, power consumers also need an unencumbered exit option.

Third, since the main responsibility for infrastructure provision still is in government hands, there is need to devise ways of reducing revenue constraint by introducing cost-sharing schemes. The argument is that if assured improvements in provision communities are willing to meet a substantial portion of the costs of service delivery.

In practice, however, cost sharing has proved difficult to implement at the poorer end of the income distribution. In poor urban areas and the rural sector, water is often supplied communally and free rider problems have been formidable. Still, involving communities in the planning and financing of water supply is one of the best ways of building systems that are functional and sustainable.

Fourth, to provide infrastructure services at reasonable cost demands huge investments in production capacities. This is often an effective entry barrier in poor countries. Aggregates in the power sector, for example, are difficult to split up and often are purchased by a single private operator. This in turn confers a degree of monopoly power on utility companies that must be countered by a national regulator.

However, the activities of the national regulator need to be clearly specified in order to prevent it from falling back on the control tactics of old. It will have to ensure that standards are upheld, but without being obstructive. Such an agency would also assume the planning and development function for the relevant infrastructure service. It will need to take into consideration the long-run needs of the manufacturing sector and to find ways in which the private sector could participate beneficially in service expansion and development.

In conclusion, the government was the sole supplier of infrastructure in the past, and there might still be arguments in favour of continued state intervention in some areas, if only to ensure that the poorer urban areas and the rural sector have access to services. However, in the past the goals of a more egalitarian distribution of services, for example, via urban upgrading, rural road construction

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and rural electrification, were defeated by paucity of resources and poor planning. The government has now found it necessary to incorporate communities and the private sector in the search for ways to raise efficiency and improve service provision. The new situation will demand rapid institutional change, including new legislation to regulate the various aspects of the market for utilities in the wake of the dismantling of the state monopolies and the introduction of new technologies.

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