HARNESSING THE UTILITY OF URBAN INFRASTRUCTURE ASSET MANAGEMENT IN ETHIOPIAN CITIES: CHALLENGES AND OPPORTUNITIES

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ABSTRACT

Current urbanization trends have resulted in insatiably high demand for urban infrastructure and services. Municipal authorities are faced with the challenge of maintaining the existing stocks as well as expanding their coverage and capacity. The provisioning of such infrastructure and services demands massive resource allocations from national budgets, which are not always available for most developing world cities. There is therefore the need for proper management of existing infrastructure stocks, which must be supported by prudent investment decisions. While the rationale behind asset management as a decision making tool cannot be overemphasized, many municipal authorities are confronted with problems of poorly performing and dilapidated infrastructure as well as misguided costly investment decisions. The situation in Ethiopian cities is reminiscent of this fact. This paper analyses the cities' asset management systems, challenges and opportunities. This is done in the light of the current efforts to digitalize the cities' systems through GIS. The paper then explores the extent to which asset management is being integrated into the digitalization process for effective infrastructure provisioning.

1. INTRODUCTION

World over, rates of urbanization are on the increase. However, urban population growth, particularly in the developing world, has not been matched with investment in the requisite infrastructure and services. Investments in new infrastructure always lag behind demand. Operation and maintenance of existing stocks is also compromised. It has become common to have overcrowded and over utilized facilities. In Ethiopia, like in many other developing countries, a number of urban settlements are not adequately supplied with requisite infrastructure and services.

The major role played by urban infrastructure and services in economic development and poverty alleviation cannot be overemphasized. Given the high cost of investment and adverse consequences associated with poor infrastructure and service facilities, there is critical need for proper management of existing stocks. Pickering, et al (1993) noted a number of ways in which inadequate management and maintenance of urban infrastructure and services curtail economic growth and development. These include the exposition of urban populations to health risks, limiting productivity through service cuts, increase in household and investor costs through property damage and increasing production costs through congestion, accidents and traffic jams.

Most central and sub national governments (SNGs) are currently failing not only to cope with the insatiable and increasing demand for infrastructure and services, but also to operate and maintain existing stocks. This is largely attributed to restricted national and local budgets. It is also a result of unnecessarily high investment costs arising from a general dearth in information on operation, maintenance and capacity requirements of existing infrastructure stocks. For most governments demand feasibility information is limited if not absent. Economic and efficient infrastructure investment, maintenance and management heavily depend on proper and adequate planning, which in turn requires updated and accurate information on existing stocks, capacity, age and condition. Absence of such information compromises service quality, safety, financial performance and the proper sequencing and planning of operation, maintenance and extension of infrastructure and services. Overally, the absence of such information adversely impacts on economic performance, life quality and the general environment.

This paper explores this argument within the Ethiopian context. It analyses how the added value of urban infrastructure asset management can be harnessed to improve on urban infrastructure provisioning in Ethiopian cities. The paper evaluates the current practices, policy framework, existing challenges and potential opportunities that can be utilized through urban infrastructure asset management.

2. CONEPTUAL FRAMEWORK

Urban infrastructure assets can be described with different levels of detail depending on purpose of such categorization. For instance a road network can be described as an entire network or its constituent parts i.e. specific lengths, intersections, signs etc (Abbott, 2006). Generally physical infrastructure assets include transport, water and waste water, solid waste management, energy production and distribution, buildings, recreation facilities and communication facilities (Haas et al. 2000). They can be provided by a variety of organizations, depending on the institutional and policy arrangements in place. The latter arrangements are also influenced by the country's history and political ideology. Some countries deliberately decentralize infrastructure and service provision responsibilities to municipal authorities and also incorporate the private sector through diverse forms of public-private partnerships. In Ethiopia, private sector participation is limited, with the responsibility mainly being shouldered by municipal and regional governments (Nyarirangwe et al. 2007).

Urban infrastructure asset management originated in the early 1990s, mainly in the field of road pavement and bridge engineering. Its importance has continued to grow while its application is being spread to the management and administration of diverse urban assets. By definition it is a comprehensive strategy, aimed at efficiently and effectively managing infrastructure assets across their entire life, in order to optimize their aggregate value and provide for replacement at the most appropriate time (Abbott, 2006). It is therefore a systematic and comprehensive approach to the management and planning of maintenance, upgrading and operation of physical infrastructure assets, cost effectively (Haas et al. 2000, Abbott, 2006). It therefore allows the responsible authority to determine the infrastructure assets owned, their worth, financial obligations and their residual life. Vanier et al, (1998) defined it as a set of innovative, decision-making tools that assist city engineers and managers in making choices between long-term alternatives related to the maintenance, repair and capital renewal of mixed urban infrastructure assets.

Although the application of the system varies with different infrastructure assets, it generally involves a process of identifying or inventorying of the main classes or types of assets, their locations, amounts or extents, and their current conditions (Abbott, 2006). It must therefore be closely linked to the authority's spatial planning process as well as sector policies to facilitate integrated management. This is so against the background that the long term cost of maintaining urban infrastructure, as well as the performance of the assets, should be the critical factor in planning and design. More so, the future value of all planned assets must be established in terms of their costs and returns on investment. Thus the manager needs to answer the following questions: *what assets do we have, what is their condition, and what is their value?* For the last question to be of any significance in infrastructure assets there is need for timely and adequate maintenance to counter rapid deterioration and loss of value (Haas et al. 2000).

It must attempt to address broad objectives which include cost recovery and economic sustainability, efficient and effective service delivery, providing accessible and affordable infrastructure, employment creation and poverty reduction as we as environmental protection (Abbott: 2006). The system should therefore provide the foundation for the establishment of long term and sustainable information systems. It therefore requires accurate and up-to-date information. The collection and processing of the required information in building and maintaining such a system should be managed properly, usually requiring the triangulation of a variety of sources. It is hence critical for responsible governments to decide on how to deal with related institutional, organizational and technological aspects. The system must also be readily accessible to and usable by anyone requiring information. It is also critical to plan for the necessary feedback with users so as to keep the data base up to date. (Pickering et al.1993).

Urban infrastructure asset management is critical because of the myriad of challenges faced in infrastructure provisioning. Firstly urban infrastructure investment, operation and maintenance require huge resource outlays. For instance in Canada, municipalities annually spent a disproportionate share of construction budgets on maintenance. This has resulted in most of them continuously experiencing accumulated budgetary shortfalls to rehabilitate their infrastructure assets to acceptable conditions. Other challenges include decay due to usage, age, climate, geological conditions, insufficient funding, poor finance management, inadequate and irrational investment decisions, lack of political will for operation and maintenance, unavailability and or improper use of technology and lack of human resource capacity, all of which reduce the longevity of the assets. (Haas et al, 2000; Vanier et al. 1998).

It is against this backdrop that the preservation of these valuable assets becomes very essential. Urban infrastructure asset management systems should clearly outline what rehabilitative, preventive and corrective maintenance actions should be taken at what locations and at what times (Haas et al. 2000). The system also derives utility from its capacity to give recognition to the role of operation and maintenance in optimizing the value of infrastructure assets. Economically, it also allows for the integration of the costs of operation and maintenance in the overall capital cost of the project. Urban infrastructure asset management's life cycle approach permits better appraisal of alternative options, than traditional project planning techniques such as the payback methods. This makes the system a better aid to infrastructure project budgeting, by allowing operation and maintenance to be built into the overall project budget, thereby permitting better long term financial planning

(Abbott, 2006).

Good urban infrastructure asset management and proper preservation strategy increase the value of assets and their lifespan. Urban infrastructure asset management is also very important in guiding investment decisions and promoting good management practices. Haas et al (2000) summarized this in Figure 1 below. Infrastructure assets management also uses a variety of methods which include the deferred maintenance, the inspection, maintenance and repair, the rehabilitation and capital renewal and utility mapping methods. Geographical Information Systems (GIS) and Computer Aided Design methods (CAD) are also fast becoming popular mainly in the management of cadastral information. GIS provides data on the physical descriptions of assets in form of maps or charts, demographic information related to these spatial units, etc. It is often used together with satellite imagery information to give precision to the data and effectively aid decision making (Vanier et al. 1998).

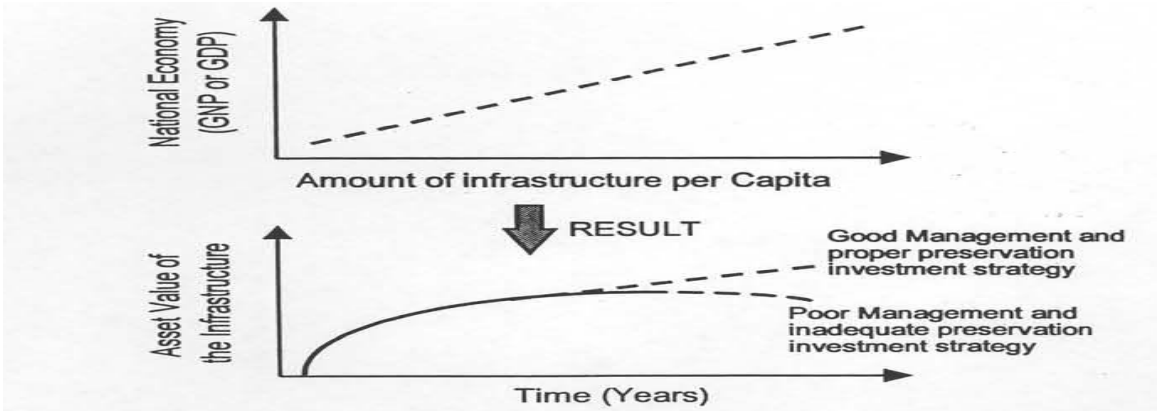

Figure 1 The Utility of Good Urban Infrastructure Asset Management (From Haas et al. 2000)

Despite the utility offered by the above methods, they are mainly suitable in mature cities, where there is adequate and accurate information. In most developing countries, such as Ethiopia, there is a general dearth of such information. Data gathering, processing and storage in an updatable manner is a costly process, which is not usually prioritized by most developing world governments. There is also a major human resource capacity challenge, which may result in the wastage of the massive investments in the above systems, due to under-utilization. These handicaps are however not an excuse for the absence of well planned asset management systems (Abbott, 2006).

3. STUDY METHODOLOGY

This paper is a synthesis of consultant reports and other secondary material on the subject matter. It also encompasses results of discussions with federal government and local authority officials. The Urban Development Capacity Building Office (UDCBO) and the Ministry of Works and Urban Development (MoWUD) provided the bulk of the data which was used in this paper.

4. FINDINGS

4.1 Urban Infrastructure Provision In Ethiopia

Ethiopia is the third most populous African country with a total population of about 71,066,000 (Mulugeta et al. 2004). Of this population, about 16 percent live in urban areas. In economic terms, Ethiopia is one of the poorest African countries with an estimated per capita Gross Domestic Product (GDP) of approximately US$118 (IBIS, 2005).

There has been a major change in the government's economic development discourse since the ousting of the Derg regime in 1991 (World Bank: 2002). The urban sector is now considered the main front for economic development, a move from the traditional agro-based discourse. This was mainly due to the recognition of the importance of rural-urban linkages and the potential of cities to act as harbors for investment, markets and general economic growth. In 2003 urban areas contributed about 55 percent of GDP. This is not comparable to the average situation in Sub-Saharan Africa (85 percent) and other low-income countries (75 percent). Nonetheless, the government is promoting the development of a balanced urban system, which offers opportunities for improving market integration, facilitating exchanges, division of labor, and diversification (Mulugeta et al. 2004).

The country has also experienced a general swell in urban population and the associated increase in poverty in the last few decades. Generally, its urban centers are characterized by poorly developed economic bases, high levels of unemployment and high incidences of chronic poverty, estimated at over 40 percent, particularly among slum dwellers (Mulugeta et al. 2004). Ethiopian cities also exhibit poor infrastructure and services, with between 70 and 90 percent of their built up areas largely categorized as slums (IBIS, 2005). This has prompted the government to prioritize urban poverty alleviation, employment creation and infrastructure provision through policies such as the PASDEP and PSCAP.

The main problems affecting infrastructure provision in Ethiopian cities are two fold. Firstly the government, which is the main funder of infrastructure projects, is faced with serious budgetary constraints. This is so against the backdrop of limited private sector participation (MoWUD, 2006). Secondly, SNGs are characterized by major capacity challenges regarding the planning and implementation of infrastructure projects. There is a general dearth of accurate information on the status of current infrastructure stocks in terms of condition and capacity, as well as levels of demand and resultant backlogs. This makes planning very difficult. Additionally, most cities fail to attract qualified planners and engineers to carry out demand feasibility studies, infrastructure project planning, implementation and asset management (MoWUD, ibid).

The government has however acknowledged this fact and has embarked on a number of capacity building programs. A number of consultant companies have been awarded tenders to conduct demand feasibility studies, asset condition studies and make recommendations. The most common of these recommendations pointed at the need for capacity building and the prioritization of urban infrastructure asset management (GTZ, 2006).

4.2 Urban Infrastructure Asset Management in Ethiopia

Most of Ethiopian cities are undergoing rapid growth (estimated at about 5 percent per annum) (Abbott, 2006). Thus, the demand for infrastructure and services is surpassing the current capacity. Existing infrastructure stocks are also deteriorating rapidly and in need of

urgent rehabilitation. Future prospects do not look bright either. There is need for urgent classification of the infrastructure assets to accurately plan for their maintenance, rehabilitation and expansion. At this point infrastructure asset management becomes not only feasible but appropriate.

Urban infrastructure and town planning have traditionally been done by the National Urban Planning Institute, at central level. As a result local level needs are not adequately addressed in the design of infrastructure projects. Consultant reports and discussions with Federal and local government officials indicated that in many municipalities infrastructure planning and design have not been backed by demand feasibility studies and forecasts. In some cases costly project conflicts were encountered. For instance road and bridge construction often resulted in unearthing of underground electricity and telecommunication cables, as well as water and sewer networks. Works on the latter also resulted in damages to drainage systems and the subsequent washing away of roads. These problems are a result of the absence of up to date data on existing infrastructure networks. This was also worsened by poorly coordinated project-based approaches in the planning and implementation of different sectoral infrastructure projects. (Urban Institute, 2005)

The government came up with a number of policy programs to facilitate the creation of urban infrastructure asset management system. For instance the Urban Infrastructure and Service Improvement Sub-Program was promulgated in 2006, to reinforce the need for these systems. The government also appointed the Urban Institute in 2005, to carry out studies and produce Urban Infrastructure Asset Management (UIAM) and the Municipal Infrastructure Investment Program (MIIP) Manuals. These would guide municipalities in developing urban infrastructure asset management system. Many municipalities in Ethiopia have started developing infrastructure asset inventory databases. Discussions with federal and local government officials indicated that most municipalities do not really know what to include in the inventories or how to use it in planning proactively. As a result, they rarely refer to the inventories, thereby reactively responding to infrastructure investment planning and management needs.

The government also appointed GTZ-IS to conduct infrastructure assessment surveys in selected urban centers in 2006. Urgent creation of infrastructure asset management systems was strongly recommended. This was so against a background of poor conditions across all municipalities' existing infrastructure stocks. Although municipalities, such as Addis Ababa, have invested in GIS and CAD bases, they have not adequately integrated their infrastructure rehabilitation and investment programs.

4.3 Main Urban Infrastructure Asset Management Challenges in Ethiopia

A number of reasons were used to explain the poor infrastructure management systems. The major reason has been associated with lack of human and financial resource capacity among most municipalities. There is a general lack of understanding of how to properly manage infrastructure stocks. The provision of infrastructure, which most urban local authorities defined as road and drainage construction and maintenance, is a low profile section of their technical departments. In all these municipalities, roads and drainage are therefore a function performed within a department responsible for building plan approval and on-site plumbing. As a result over 60 percent of the time and effort of the department is spent on building plan related activities. These departments also fail to attract qualified personnel due to poor remuneration. For instance in Awassa, the starting salary for a graduate engineer is Ethiopian

Birr (ETB) 980, compared to over ETB3000 in the private construction industry (GTZ-IS, 2006; UIASI, 2005).

Another major problem has to do with high capacity utilization levels, characteristic among most urban centers. This is mainly due to the increasing urban population and resultant demand for infrastructure and service, particularly roads, drainage and water supply. Infrastructure facilities deteriorate rapidly and are very expensive to maintain. Although there is a deliberate move to use simplified gravel and red ash roads as cheaper alternatives, this is not supported by an appropriate knowledge base. On-site inspections indicated that there is very limited success on the ground. These efforts are also undermined by the absence of an effective drainage system, which has seen most roads being constantly washed away and damaged by storm water (GTZ-IS, 2006).

Most municipalities do not have proper systems and procedures for maintenance, and there are no infrastructure inventory databases in place. This is made worse by the fact that there are also no engineering drawings covering the existing road and drainage networks. Infrastructure projects were implemented as per Master Plans produced by the National Urban Planning Institute, located in Addis Ababa. These are the only diagrams found across most cities. Infrastructure functions are grouped around the objective of sustaining the Master Plan and as a result there is limited incentive to plan infrastructure independently. There are no engineering diagrams which are a true reflection of the infrastructure on the ground. This problem, coupled with the general absence of clear financing plans, makes effective maintenance planning and justification largely impossible. This is further exacerbated by the fact that municipalities do not have their own local level infrastructure design data and standards. As a result very little attention is paid to these during rehabilitation and maintenance. In fact infrastructure rehabilitation and maintenance are of low priority within most municipal administrations (GTZ-IS, 2006).

4.4 Recommended Approach to Urban Infrastructure Asset Management

The utility of infrastructure asset management cannot be overemphasized in the above circumstances. The starting point is a major institutional transformation (Pickering et al. 1998). Firstly, there is the need to establish departments within municipalities that specifically deal with infrastructure assets management. Currently most municipalities do not have such departments. Instead infrastructure is a responsibility performed under the construction and building departments. For these departments, more priority and urgency is placed on planning, land administration, building permits and building plan approval at the expense of infrastructure planning, maintenance and rehabilitation (GTZ-IS, 2006).

Secondly, there is the need to undertake utility mapping, by effectively utilizing the new CAD system. It is notable that most municipalities in Ethiopia have established some state of the art GIS and CAD systems. Nonetheless, these systems are not being effectively utilized in infrastructure inventorying and planning for effective maintenance and rehabilitation. This must be supported by a broad capacity building exercise in terms of human and financial resources. These can be integrated into the on-going PASDEP and PSCAP programs (MoWUD, 2006, UIASI, 2005).

GTZ-IS (2006) suggested a simplified but effective infrastructure asset management system. This is against the background that most Ethiopian municipalities are struggling with capacity problems. Most have neither the required personnel skills nor the financial resources to

undertake detailed infrastructure inventories, input it into the CAD and GIS systems, and regularly update it. However, as noted by Abbott (2006), lack of such capacity is no excuse for not building a basic infrastructure asset management system. Instead the benefits associated with having such a system surpass the aggregate costs of poor investment, operation, maintenance decisions that go with its absence.

Thus GTZ-IS (2006) suggested a 6-step infrastructure asset management system. The main steps involve the establishment of a local level infrastructure asset working group, preparation of infrastructure asset inventory schedules, collection of infrastructure asset data, quality controlling of incoming data, and lastly the refinement of the infrastructure assets schedules. Municipalities would have to acknowledge the fact that this is not an easy process. It is not only labour intensive but also one where, despite having paid significant attention to detail, rechecking and cross-checking the data, data discrepancies will always be encountered. There is the need to convince authorities at federal and regional levels on the added value that come with asset management, for its implementation to be adequately supported by the requisite policy and institutional frameworks.

5. CONCLUSIONS

The utility of urban infrastructure assets management cannot be overemphasized. Among other things, it benefits municipalities in guiding infrastructure investment, operation, maintenance and rehabilitation decisions. The establishment of such management systems is resource intensive. In Ethiopia, municipalities face the critical challenge of lack of capacity. Nonetheless, there is an urgent need for the establishment of infrastructure asset management systems. Given the current opportunities reminiscent of most of these municipalities, it is not an insurmountable task. For instance most municipalities have already developed CAD and GIS systems. The only problem is that they are not being fully utilized for the benefit of infrastructure management. As a result most infrastructure networks and stocks are in a poor state. The municipalities can begin by establishing a rudimentary management system, supported by a holistic institutional transformation, and integration in current federal government urban development policies. This can then be further refined and developed over time. The Infrastructure Asset Management Manuals by GTZ-IS can provide the necessary important guidelines.

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